The treatment of Infant Sleep Disturbance by implementing an Incremental Graduated Planned Ignoring Programme at bedtime-only.

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ABSTRACT

Infant sleep disturbance has been treated effectively using an incremental graduated planned ignoring programme at bedtime and throughout the night. In partial replication of a study done by Mindell and Durand (1993), this study looked at whether using this programme at bedtime-only would be effective in the treatment of infant sleep disturbance. The assumption was that, following the intervention at bedtime-only, either the infant's and/or the parents behaviour would generalise from that used at bedtime to that used during subsequent night wakings. The generalisation was expected to result in a decrease in the problem behaviours that had previously followed night wakings. The use of the incremental graduated planned ignoring programme at bedtime-only involved parents deciding on a set bedtime and bedtime routine. By the end of the bedtime routine the infant was to be awake and in the cot. Parents were to wake for increasing periods of time before attending to their infant if he/she signalled once left to fall asleep in the cot. Parents were able to treat their infant's night wakings in whatever manner they chose. A single subject, multiple baseline design was used to determine the effectiveness of this programme in treating seven infants and their families. Three measures were calculated (1) initial sleep-onset delay, (2) frequency of night wakings, and (3) night sleep-onset delay. Results showed that the use of the programme at bedtime-only was effective in treating sleep disturbed infants. Only the parents' behaviour was seen to generalise following the intervention. No generalisation was noted in the infants behaviour. It was concluded that the success of this bedtime-only intervention, in treating both bedtime and night-time problems, rested on the generalisation in the parents' behaviour.

CHAPTER 1

INTRODUCTION

1. Defining ISD

Infant Sleep Disturbance (ISD) is a common problem that has been found to affect 15% - 30% of infants and their families (Anders, 1979; Scher, 1991; France & Hudson, 1993). The reported prevalence of ISD varies between studies. This is, in part, due to the criteria used to define it. For the Canterbury Sleep Programme two main criteria have been adopted for diagnosing an infant as having ISD. The first is that the infant must be between six and twenty-four months old. This age restriction is important because infants under 6 months may need to wake for feeding and related care, and those over two years old have more developed cognitive and verbal abilities which permit different approaches to the treatment of their sleep problems (France, 1994). The second criterion for treatment is that parents must see their infant's sleep related behaviour as a problem and seek help in modifying it. Some parents accept such sleep patterns and do not present for treatment. A number of sleep problems may be categorised as ISD including (1) Bed refusal, where infants resist bedtime and going to sleep, (2) Sleep Onset Delay, where infants take a long time to fall asleep at the beginning of the night, (3) Night waking problems, where infants wake regularly during the night and may also take a long time to resettle and (4) Co-sleeping, where the parents are unhappily sleeping together with their infants (France, 1994).

2. Effects of ISD on all members of the family

2.1 Effects on infants

2.1.1 Long-term sleep difficulties

The effects of ISD on the infant include long-term sleep difficulties and the development of other behaviour problems. There is also an association with an increased occurrence of medical problems although the direction of the effect has not been established. Recent studies on the long term effects of ISD on sleep indicate that sleep problems may become long-standing and be involved in the later development of chronic sleep disorders lasting well into adulthood (Sadeh, 1996, Sadeh & Anders, 1993). Pollock (1992) found that children with reported sleeping problems during infancy were more likely to have similar problems at ages five and ten than were those who did not have ISD. Another study looking at the prevalence of sleep problems at eight months and three years, found that of all infants with ISD at eight months, 41% still had sleep problems at three years of age (Zuckerman, Stevenson & Bailey, 1987). Minde (1995) also reported that children who have severe sleep problems at 36 months of age are likely to still have these problems in the future, with more than half of the infants in the study showing the same symptoms five years later.

2.1.2 Development of other behaviour problems

Numerous studies have found ISD to be related to the later development of other behaviour problems. Zuckerman *et al.* (1987) reported that children with sleep problems were more likely to also have additional behavioural problems, especially tantrums and behaviour management problems, than did those without ISD. Pollock (1992) also found

a link between ISD and the development of further behavioural problems, in particular the occurrence of eating problems, restlessness, irritability, disobedience, temper tantrums, hyperactivity and anxiety.

2.1.2 Increase in medical problems

It has also been found that there is a relationship between ISD and an increase in medical problems (Stevenson, 1993). Zuckerman *et al.* (1987) suggest that, "those children with reported sleeping problems as an infant were more likely to have been admitted to hospital, have had GP home visits and to have had frequent sore throats requiring medical attention" (pp 157). It is likely, of course, that these medical problems may be exacerbating the ISD rather than vice versa. In contrast to Zuckerman *et al.*'s claims, Tirosh, Scher, Sadeh, Jaffe, Rubin and Lavie, 1993 investigated the number of medical problems experienced by both infants with and without ISD and found no significant difference between the two.

2.1.3 Hours of sleep

Research has shown that sleep disturbed infants tend to get fewer hours of sleep per night than do those without ISD (France & Blampied, In Press, Bernal, 1973). An important point to address, considering these findings, is the precise nature of the function of sleep. Following this the question of whether infants with ISD suffer developmental problems as they age.

All humans need to sleep and feel tired when they do not get enough sleep. Dahl (1998), states that , "insufficient or disturbed sleep has a negative impact on multiple aspects of physical and mental health-particularly in the control of behaviour, attention and emotions" (pp73).

Little research has been done on the need for sleep in humans and so to-date there are only two major theories on this issue. The first one sees sleep as primarily functioning to restore the central nervous system (CNS). This rests on the contention that the CNS becomes fatigued during waking hours. Sleep then acts as a period where the CNS can 'rest and recharge' (Salzarulo & Fagioli, 1995, Zenbobia & Stein, 1993). In support of this theory contemporary research has found that brain protein synthesis occurs more during sleep than when the individual is awake and that in the late evening more amino acids are liberated than at any other time of day. This shows that the CNS is rejuvenating during the less busy time of the late evening and while asleep. REM sleep has also been found to assist in the restoration of our emotional well-being and therefore sleep is needed for healthy emotional functioning as well as for physical functioning. (Minde, 1995). Finally, the secretion of human growth hormone (HGH) has been found to be sleep-state (i.e., REM and NREM sleep) dependent and to occur, under normal circumstances, during NREM sleep (Hirshkowitz, Moore & Minhoto, 1997; Koysto, 1999). This implies that if the infant's sleep is disturbed, so is the release of HGH, which may have effects for the progress of his/her development.

The second theory is based on the ideologies of conservation and ethology. This theory suggests that human survival is dependent on our ability to adapt to the world around us. More specifically it focuses on our ability to defend ourselves against predators. Since our lives are structured into day and night and we are unable effectively to find food in the dark, this theory suggests that it makes ethological sense for us to be inactive at night when feeding is inefficient and thereby conserve energy and avoid nocturnal predators (Minde, 1995).

In summary the two proposed reasons for sleep are: (1) to restore bodily functions through the rejuvenation of the CNS and emotional functioning through REM sleep; (2) to enable human survival where individuals feed during the day when they can see food and predators and conserve their energy by sleeping at night when it is harder to find food and to protect oneself. Both these explanations suggest that a lack of sleep would disturb the normal healthy functioning of a human being. The lack of sleep that infants with ISD get when compared with non ISD infants is a disadvantage as they are not giving their bodies as much time to recover from their daily functioning.

2.2 Effects on parents and other family members

2.2.1 Effects on family functioning

Infants are not the only ones affected by ISD. Parents are also affected as they become sleep-deprived due to their infant's sleep behaviour and also frustrated at the ongoing night wakings. All family members are likely to be tired and irritable during the day. The parents are, therefore, more likely to be stressed and angry, possibly to the detriment of

their parenting and their relationships with other family members. In the worst case, if parents are unable to cope with the problem and do not co-operate with each other in dealing with the situation, one parent may end up having to deal with the night-time problems on his/her own. Furthermore, if the parents disagree on how to address their infant's night waking their marital tensions may escalate above the level simply induced by loss of sleep. With these tensions present as well as angry outbursts at both their infant and their spouse and feelings of guilt mixed with confusion and concern, the stage is set for increasing family problems. This may result in worsening marital problems, parent-child relationship problems and the development of maternal malaise, as anxiety increases and nurturing decreases (Ferber, 1987; Minde, 1988; France, Henderson & Hudson, 1996). There is also some evidence that the presence of ISD in a family may result in an increased risk of child abuse due to all the stressors involved (Chavin & Tinson, 1980). Due to ISD's relation to family distress its treatment is important not only for the child's safety and healthy development but also for the healthy functioning of the family unit.

3. Factors that contribute to the development of ISD

There are many factors that contribute to the development of ISD. These associated factors do not influence infant sleep patterns in a linear manner. Recent literature in this area describes the process as resulting from more complicated relationships between developmental, infant and parent variables (France & Blampied, In Press). There is usually an array of factors influencing the development of ISD in an infant. For discussion purposes the factors associated with ISD will divided into three main parts.

These include (1) parental characteristics and practices, (2) infant characteristics, and (3) interactive mechanisms.

3.1 Parental characteristics and practices

3.1.1 Parents' responses to their infant

In some sleep disturbed infants the problem stems primarily from the behaviour of parents (Minde, 1988). France and Blampied (In Press) describe the parents as tending to respond to even the smallest sign of distress in their infant and therefore provide the infant with constant attention. Possible reasons why parents respond to their infants in this way include the presence of maternal depression, anxiety and fear or may be based on their own past experiences. These parents are often concerned about rejecting their infant or making him/her feel lonely if they do not respond to their every demand and thus they believe that their infant's feelings of security depend on their presence. Due to these parental actions the infant learns that he/she can demand and receive a lot of attention from his/her parents. This can lead to daily struggles between the parents and their infant as they now have a child who is unable to settle at night unless there is some form of parental interaction which helps them to fall asleep. This in turn can lead the parents to become very frustrated and exhausted by the process. (France & Blampied, In Press).

3.1.2 Parent-practices preceding the infants bedtime

A large body of research has found that a factor that contributes to why some infants signal (cry) during the night is the way in which their parents interact with them at bedtime (Adair, Bauchner, Philipp, Levenson & Zuckerman, 1991). Research conducted

by Anders, Halpern and Hua (1992) looked into the effects of bedtime routine and practices, set out by parents, in the development of ISD. They found that at three months of age those infants who were put to bed awake and left to put themselves to sleep were more likely to have learnt self-soothing techniques and would thus be able to put themselves back to sleep following their night wakings . Those on the other hand that were put to bed asleep at the beginning of the night were more likely to signal during night wakings and parents tended to remove them from their cots during these signalled awakenings, not enabling the infant to learn any self-soothing techniques. These same patterns were still seen at eight months of age. These researchers also found that infants who used sleep aids (e.g., a pacifier) tended to be put down awake and were also found to be more likely to put themselves back to sleep during night wakings at both three and eight months of age. This research implies that bedtime routines and practices at the start of the night have a major influence on the occurrences of signalling by the infant during the night as they might influence whether the infant learns to self-soothe or not.

3.1.3 Parent-controlled sleep cues necessary for sleep-onset in the infant

Sleep disturbed infants usually need some form of parental intervention (or parent controlled sleep cues) in order to fall asleep (Anders, 1979, Pinilla & Birch, 1993). Certain cues for sleep need to be present for all of us to be able to fall asleep. These cues will be different for different people. For example some people may need to have three pillows and a dimly lit room before they can fall asleep while others may need a pitch black room with the radio playing. For infants these cues may involve being fed, rocked or sung to, or being in a certain place like the lounge or at the mother's breast. As adults

we have control over these bed-time cues and can try to ensure that they are present at the start as well as throughout the night (where adults also experience "normal" night wakings during the transition of sleep phases). This in turn enables adults to fall asleep easily at the beginning and during the night. If any of these cues change (e.g. the radio turns off or a light is turned on) adults are usually able to rectify the situation so that the original cues are back in place without disturbing anyone else. The problem for infants is that they are unable to ensure that their bedtime cues remain the same throughout the night as some cues involve the presence of a parent and or a shift in location (Ferber, 1987).

This problem of not being able to control bedtime cues is where the cycle of sleep disturbances begins. Parental cues are associated with bedtime and falling asleep and are therefore needed during all subsequent night wakings to enable the infant to go back to sleep. The solution to the problem is to teach the infant to fall asleep, initially unaided, in an environment that will remain constant throughout the night so that the infant learns to self-soothe and thus parental intervention is no longer necessary to restore or supply cues during subsequent night wakings (Minde, 1995; Ferber, 1987).

3.1.4 Parent-Stimulation of the infant

Research shows that environmental events affect the maturation of sleep-state organisation (i.e., the order and duration of REM sleep and NREM sleep). Specifically, sleep-state organisation has been found to advance more rapidly when stimulation of the infant is kept low and co-ordinated both at bedtime and following night wakings (Becker,

Brazy & Grunwald, 1997).The presence of these criteria should result in more accurately defined sleep and alert states, more quiet sleep, less fussing and less crying. These findings imply that levels of stimulation given to the infant, by his/her parents, may profoundly influence the development and organisation of his/her sleep-states.(France & Blampied, In Press).

3.1.5 Parents' beliefs about infant sleep

A common belief among parents is that ISD is typified by the infant's frequent night wakings. It is in fact not the night wakings themselves that are the main problem but the inability of the infant to fall back to sleep after waking (Ferber & Boyle, 1983). This misinterpretation is easy to understand as many parents do not know what is considered to be normal infant sleep. They think of the wakings as abnormal and try to target these. They often do this by using such techniques as feeding, rocking and co-sleeping and therefore deny the infant an opportunity to learn self-soothing techniques. If their interventions during these wakings seem to be effective, why should they assume that these responses are inappropriate and even the cause of the problem? So the first step in the treatment of ISD is to teach parents about the nature of normal infant sleep and therefore enable them to understand how their responses to their infants' sleep disturbance are only helping in the persistence of the problem (Minde, Popiel, Leos, Falkner, Parker & Handley-Derry, 1993, Edgil, Wood & Smith, 1985).

The need for parental intervention to initiate sleep is a problem but the type of intervention used by the parents in order to put their infant to sleep can cause yet another

problem in the infant's healthy development. Most parents will use feeding as a form of sleep initiation which can cause an array of extra problems. First the intake of liquid during the night may result in increased wetting and therefore more wakes. Second, infants often are genuinely hungry during the night. A healthy, normally developing six month old infant should be able to go through the night without eating or feeling hungry. Therefore these feelings of hunger, although real, are not developmentally normal or nutritionally based. They are chronobiologically based, which means that the infant has learnt to expect food at certain times. Anyone at any age who eats at certain regular times will learn to become hungry at those times. This learned hunger experienced by the infants may result in some of their night wakings. Third, it is likely that other bodily systems are adversely effected by these regular nocturnal feeds. The intake of proteins and carbohydrates stimulates digestive responses as well as the absorption of food into the blood stream which stimulates endocrine responses. This results in a multitude of alterations in the infant's physiological system which are different from the state that should be present if sleep were concentrated in the night and feeding in the day. In this case the regulation and control of sleep onset, offset and cycling is likely to be affected negatively. These infants will continue expressing an immature circadian pattern, much the same as that of a neonate, where their sleep is broken into multiple segments and feeding occurs during both day and night (Ferber, 1987).

3.1.6 Parents' perceptions of their infant

An association has also been found between parental perceptions and ISD. Scott and Richards (1990) found that the mothers of sleep disturbed infants tended to perceive

themselves as being dominated by their infants and also tended to use negative adjectives to describe them. Another study by Morrell (1999) showed that many mothers of infants with a sleep disturbance had distorted perceptions of their infants and their sleep problems. They also had a greater number of misperceptions than did mothers of non-sleep disturbed infants, and their misperceptions tended to be negative. Benoit, Zeanah, Parker, Nicholson and Coolbear (1997) used the Working Model of the Child Interview to measure maternal perceptions in relation to infant clinical status. They concluded that compared with mothers of a group of infants that had not been referred to a clinic, mothers of infants with clinical problems had representations of their infants that were significantly more likely to be classified as disengaged and distorted. This finding may apply to the more severely sleep disturbed infants who may be included in clinic samples

This raises a "chicken and the egg" question. Is it these perceptions that cause ISD or is it ISD that causes these perceptions? Toselli, Farneti and Sazarulo (1995) looked at sleep representations in pregnant women and found that maternal cognitions seem to have a key role in the onset of ISD. Another study carried out by Morrell (1999) found that maternal cognitions regarding setting limits, anger at their infant's demands and doubts about their parenting competence were significantly associated with infant sleep problems.

3.1.7 Maternal attachment

Another factor that contributes to the development of ISD is maternal attachment. Benoit, Zeanah, Boucher and Minde (1992) measured the attachment of 20 mothers of infants with ISD and 21 mothers of infants without it, using the Adult Attachment Interview.

They found that 100% of the mothers whose children had ISD were rated as insecure with respect to attachment as opposed to 57% of the control mothers. These results suggest that maternal perspectives on their past relationships are crucial contributors to the development and persistence of ISD.

3.1.8 Maternal depression

The presence of parental depression is also associated with ISD. A study by Stoleru, Nottelmann, Belmont, and Ronsaville (1997) looked at mothers with an affective illness who had a diagnosis of unipolar or bipolar depression and compared their infants with a control group. The child behaviour checklist (CBCL) was used to obtain the mothers' reports, three times every four years. Reports were taken on sibling pairs (ages 1.5-3.5 years and 5-8 years at the initial assessment). For both siblings sleep problems were more severe and more frequent in the children of affectively ill mothers. In younger siblings with affectively ill mothers, the persistence of sleep problems was more frequent than those in the control group. Finally the co-occurrence of sleep problems among siblings was more frequent among those of affectively ill mothers. Although only the younger siblings in this study fit the age-criteria for ISD, these findings show that affective illness in the mother can influence the development and persistance of ISD. Murray (1991) also discovered that mothers who had suffered from post-partum depression had infants with elevated rates of sleeping problems even after the depression had been treated. A further study by Armstrong, Haeringen, Dadds and Cash (1998),however, found that the effective treatment of the problematic sleep behaviour is associated with a significant improvement in maternal mood.

3.1.9 Cultural Context of the family

Another view of ISD is that it is culturally constructed and that the problem lies with the expectations, found in Western Cultures, about infant sleep rather than in the infant's behaviour per se. Here again it is being suggested that the parents, with their cultural context, are influencing the development of ISD. This idea raises interesting questions about whether other cultures experience ISD and if not, what these parents' expectations about their infant's sleep are.

Going to bed and falling asleep alone are one of the first tasks of separation between parents and infants and therefore cultural beliefs about the importance and timing of separation can have a major impact on how bedtime and sleep are treated (Crowell, Keener, Ginsburg & Anders, 1987). One of the main cultural differences in the way parents handle their infants is related to their ideas on co-sleeping (the infant sleeping in the same bed as his/her mother). There is a common belief among many authors that the occurrence of ISD is related to culturally-based beliefs about co-sleeping which have lead western parents to separate from their infants prematurely. Consequently co-sleeping has been suggested as a cure for ISD (see France, 1994 for a current review of this).

A study by Kawasaki, Nugent, Miyashita, Miyashita and Brazelton (1994) examined the sleeping environments of Japanese infants. These researchers were interested in the apparent absence in reports of infant sleep disturbances in Japan. They looked at both rural and urban infants and found that in both settings, the infants slept in very close proximity to their parents for the first three years of life. The Brazelton scale was used to

measure the behavioural repertoire of these Japanese infants, and the results showed that they were alert and responsive and showed little state lability (i.e, disorganisation of sleep states). They were also able to habituate especially well to negative stimuli when asleep. The authors concluded that the relative absence of ISD in Japanese infants could be due to a combination of two things. First the infants' behavioural pre-disposition to be able to habituate to negative stimuli while sleeping (genetic) and second the infants are in a sleeping environment that enables extensive physical contact between parents and infants (parental beliefs leading to an acceptance of co-sleeping).

Lee (1992) looked at the prevalence of ISD in Korean infants and found that ninety-eight percent of infants slept with a member of their family. On average, eighty-three percent of these infants woke and disturbed their parents during the night and twenty-eight percent of these cried during awakenings. Sixteen percent of these co-sleeping mothers reported their infant's sleep disturbance as a problem. This research shows that the behaviours typical of ISD are common among Korean infants and that co-sleeping is not preventing the development of ISD in these children.

Freedman (1974) argued that co-sleeping may not have a uniform effect among the human species, as qualities such as temperament and general development may vary across ethnic groups. Temperament, specifically, has been found to have a profound effect on the development and persistence of ISD (Richman, 1981; France & Blampied, In Press; Van Tassel, 1985). Studies have shown that there are low rates of ISD among black American infants who co-sleep, yet there are high rates of ISD in white American

infants who co-sleep. This phenomenon could be related in part to temperament as black American infants in this study were also found to have easier temperaments than did white American infants. These findings suggest that there may be an ethnic difference in the prevalence of ISD but that it is based on genetic factors such as temperament, rather than just on culturally-determined parental beliefs about infant sleep (Crowell et al, 1986).

3.2 Infant characteristics associated with the development of ISD

3.2.1 Structure of infant versus adult sleep

One of the major factors contributing to the development of ISD is the structure of infant sleep itself. Infant sleep is structurally different from that of adults and therefore it is import to make a distinction between the two when trying to understand why infants are at such risk of developing ISD. Infants are not born with the ability to sleep through the night. Initially there is very little day-night differentiation in the neonate's (0-1month) sleep-wake cycle. Their sleep periods can be erratic during the first few months of life with sleep lasting from about twenty minutes to six hours. Neonates will fall asleep six to eight times a day, will feed every two to six hours and will sleep for about sixteen and a half hours a day (Ferber, 1987, Hethering & Park, 1999; France & Blampied, In Press).

Although the neonate's diurnal sleeping routines and habits are not well organised at birth, when he/she is asleep the sleep-states themselves show clear and predictable organisation. Sleep begins with the neonate entering the REM (rapid-eye-movement) stage of sleep and then approximately an hour later the NREM (non- REM) stage or

"quiet sleep" begins. These two stages of sleep alternate on an approximately hourly basis. Due to these frequent changes in stages during sleep there are many opportunities for neonates to wake as they progress from one stage to the other because the frequent REM arousals are often followed by wakefulness (Ferber & Boyle, 1983; France & Blampied, In Press).

The structure of adult sleep is very different from that of a neonate. The adult sleep cycle begins with NREM sleep as opposed to REM sleep. The NREM sleep is divided into 4 substages which represent different levels of sleep (i.e., deeper sleep in stage 4 to lighter sleep in stage1). The adult goes straight from wakefulness into deep sleep, passing through stages 1-4 of NREM sleep very quickly at the beginning of the night. Then after about 70 minutes stage 3 briefly reoccurs before the first period of REM sleep begins. Throughout the night most of the NREM sleep occurs during the first third and REM sleep during the last two thirds (Parkinson, 1994; Pressman & Orr, 1997).

Infant sleep rapidly develops to more closely resemble that of adult sleep. By about three to six months of age the infant's NREM sleep has developed so that it is divisible into 4 substages. The general structure of the infant's sleep is now more typical of adult sleep. However NREM sleep is still quite underdeveloped and different from adult sleep. Transitions from NREM sleep to REM sleep are still not smooth at this age. REM sleep still provides a higher proportion of the infant's sleep and is more evenly distributed throughout the night. Sleep onset is more like that of adults' in that it begins with NREM

sleep as opposed to REM and the development of a diurnal sleep pattern also occurs generally by this age (Ferber, 1987).

At approximately six months of age infants typically sleep for a total of 14 hours. They sleep for about three hours during the day, which is divided into two naps, and about eleven hours during the night. Before this age infants need to be fed during their night wakings as their metabolism has not developed enough to enable them to only feed during the day. But at about six months a well nourished infant no longer needs to feed during the night and therefore should be able to sleep through without disturbing their parents. The amount of sleep that infants and children need will gradually decrease over time. Day-time naps will fade out by about age 3 and by 5 years of age and by this age the structure of children's sleep will typically be the same as that of adults. (Ferber, 1987).

The most important difference between infant and adult sleep is that infants have many short sleep cycles and are more likely than adults to wake due to arousals from REM sleep. Although the ability to maintain sleep usually stabilises after early infancy and remains stable until adulthood, brief night wakings due to sleep phase transitions do still persist through the lifespan (Ferber, 1987).

3.2.2 The infant's Motor Development

Another possible infant characteristic that may contribute to the development and maintenance of ISD is the level of motor development that the infant has reached. Scher and Ratson (1998) looked closely at the effect of motor development on the occurrence of

ISD and found that infants with more advanced motor development had more bedtime problems and more night wakings. Scher (1996) also found that the onset of upright locomotion around 12 months is associated with an increase in night waking.

3.2.3 Infant-Temperament

Reasearch on the influence of negative temperament in the development of ISD has shown a positive relationship between the two (Messer & Richards, 1993). Richman (1981), looked at 1-2 year olds and showed that many sleep disturbed infants seem to have other behavioural and/or temperamental difficulties. ISD was also prominent in chronically irritable infants and those with birth difficulties. Another study by Sadeh, Lavie and Scher (1994) looked at maternal perceptions of temperament of sleep disturbed infants. They noticed that children with night waking problems were rated by their mothers as having lower sensory thresholds and being less adaptive than the control group studied. On the Parental Stress Index (PSI) they were rated as more distractible, less adaptive, more demanding and less reinforcing than the controls. Therefore the authors concluded that sleep disturbances in early childhood are closely associated with negative maternal perceptions of their child's temperament. Sadeh *et al.* (1994) do make an important point when discussing the impact of infant temperament on the development of ISD. They point out that the behaviours associated with difficult temperament may occur due to the sleep disturbance rather than being due to a factor inherent in the infant.

3.4. The characteristics of the relationship between parent and infant

3.4.1 Emotional exchanges

Emotional exchanges between parents and their infants are yet another factor that has been linked with ISD. Guedeney and Kreisler (1987) looked at the effect of "mother-child emotional exchanges" on ISD. They found that the infants behaviour can be paralleled with their mother's speech and emotional attitudes, and therefore, that a mother's withdrawal of affection and emotion can influence the development of ISD.

3.4.2 Behaviour traps

Sleep is a necessary daily process that is essential in the healthy functioning of any individual. Since sleep is essential, and as humans we tend to suffer when we lack sleep, sleep can be seen as a reinforcer to both parents and infants. Due to the reinforcing properties inherent in sleep, any behaviour that successfully precedes it is likely to increase in similar situations in the future (Blampied & France, 1991). In the case of families who are trying to deal with ISD, the infant will be reinforced for crying when wanting to go to sleep as this usually results in some form of parental intervention which in turn leads to the onset of sleep. The parents learn that attending to their infant results in the onset of his/her sleep, leaving them to return to sleep as well. These reinforcers are the foundation of a complex chain of behaviours where the infant learns to increase the frequency and intensity of cry in order to receive the parental attention needed to ensure the onset of sleep .The parent learns to increase the intensity of the stimulation they give to the infant in an attempt to get him/her to sleep. This scenario is an example of what is called a coercion trap. Within this trap both parties are acting to avoid aversive stimuli.

The infant does not want to be in an unfamiliar, stress-evoking situation where he/she has to fall asleep alone and the parents want to avoid the infant's crying behaviour (France & Blampied, In Press).

4. The treatment of ISD

If undetected and left untreated, behaviour problems do not necessarily diminish over time and may have serious consequences for the developing relationship between children and their parents (Hewitt, Powell & Tait, 1989). Treatment of ISD is usually based on either some form of systematic, planned ignoring (also known as extinction) which involves leaving infants to cry for longer and longer periods of time with the aim of extinguishing the problem, or on pharmacological treatment where medication is used in an attempt to solve the problem, or on a combination of these treatments (France, Henderson & Hudson, 1996). The concept behind the behavioural treatment of ISD is that positive reinforcement for resisting bedtime and for night waking is removed in order to avoid coupling signaling with a desired consequence (France & Hudson, 1993).

Numerous studies have looked at differing treatments of ISD and how effective they are. There are many effective forms of treatment that have been established and researched. These include behavioural techniques such as planned ignoring, variations of this like incremental and decremental planned ignoring, minimal check or parental presence, scheduled awakening, fading, stimulus control and pharmacological techniques, as well as a combination of these. These different forms of treatment are discussed below.

4.1 Planned ignoring.

This technique involves parents having a set routine leading up to bedtime which ends with them putting the infant in the cot and leaving the room. Once the room has been left they are not to return until an agreed upon wake-up time in the morning. All crying is ignored throughout the night unless the parents fear that their infant is sick or in some sort of danger (Weir & Dinnick, 1988; Lawton, Blampied & France, 1995). This technique has been found to be a rapid, effective treatment option but many parents are apprehensive about using it as they anticipate it to be very difficult to leave their infant to cry without attending to him/her. Although this treatment may sound to many parents as if it would be stressful, current research has found that once the parents actually implement the programme they do not find it especially stressful (Lawton, France & Blampied, 1995). On the contrary, planned ignoring has been found to decrease the mother's anxiety and distress (Durand & Mindell, 1990).

Despite the fact that research shows planned ignoring to be a lot less stressful than many parents anticipate, there are still many parents who do not feel that they could implement and comply with such a programme. Owing to these concerns attempts have been made to adapt the planned ignoring technique in order to lower the expected parental and infant distress, and also to reduce the post extinction response burst (PERB) which seems to be common in this type of behavioural treatment (Lerman & Iwata, 1995; Reid, Walter & O'leary, 1999). The PERB involves the behaviour of the individual being treated becoming a lot worse at the start of the programme. In relation to ISD, many infants may become very frustrated when they suddenly do not getting attention from their parents

when they cry. They most likely will also not know how to fall asleep unaided and therefore will not know what to do when placed into the cot awake. This results in an increase in the undesirable behaviour that the parents are trying to extinguish. The PERB usually only lasts for a few days before an improvement can be seen in the behaviour. The variations of the planned ignoring programme are known as "Modified Planned Ignoring". These include parental presence, incremental graduated planned ignoring, decremental graduated planned ignoring and minimal check, and will be explained here.

4.2 Parental Presence.

This technique involves a parent sleeping in the same room as the infant. The parent is to sleep in a position which makes him/her visible to the infant. Talking to or interacting with the infant at bedtime or during the night is not allowed. The parent is to lie in silence modelling sleep (Sadeh, 1994; France, Henderson & Hudson, 1996, Owens, France & Wiggs, In Press).

4.3 Incremental graduated planned ignoring.

This technique involves parents gradually leaving their infants to cry for longer and longer periods of time before attending to them. This is done until the infant learns to self soothe and sleep through the night without disturbing his/her parents. Whenever parents check their infant during any form of modified planned-ignoring they are told to spend as little time as possible, usually no more than two minutes, in the infant's room. While attending to the infant, parents are not to turn on any lights, talk to their infant, feed or unnecessarily pick him/her up as this will only result in a perpetuation of reinforcement

for sleep-onset and night waking problems (Rolider & Van Houten, 1984; Durand & Mindell, 1990; Rickert & Johnson, 1988; Adams & Rickert, 1989; Mindell, 1999).

4.4 Decremental graduated planned ignoring

This treatment approach involves the parents slowly decreasing the amount of time they spend attending to their infant at bedtime and when he/she wakes during the night until they no longer attend to awakenings and the infant begins to self soothe during the night (Lawton, France & Blampied, 1991; Mindell, 1999, Owens, France & Wiggs, In Press).

4.5 Minimal check

This involves parents checking their infants briefly at regular intervals (e.g., every 10 minutes) until they begin self soothing and are no longer disturbing their parents during the night (Minde, Faucon & Falkner, 1994; Owens, France & Wiggs, In Press).

Other forms of behavioural treatment that are not based on planned ignoring include:

4.6 Fading of bedtime and "get up" time.

This involves utilising baseline data to determine a bedtime at which the infant is most likely to fall asleep within 15 minutes. Once this time has been established the treatment begins with the infant not being able to sleep or go to bed before this time and also not being able to get up or be attended to until an agreed upon "get up" time in the morning. If the infant falls asleep within 15 minutes of the designated bedtime for two consecutive nights then fading begins where the bedtime is made 15 minutes earlier on the third night. If the infant does not initiate sleep within 15 minutes of the designated time then the time

is made 15 minutes later until the infant starts falling asleep within 15 minutes of bedtime. The bedtime is slowly made earlier and earlier every time the infant falls asleep within 15 minutes for two nights in a row. This is done until he/she is going to bed at an appropriate time according to the parents and not disturbing them until an appropriate time in the morning (Piazza & Fisher, 1991).

4.7 Scheduled awakening

This involves waking the infant at least 15 minutes before they usually wake at night and then increasing the time before waking the infant until they are sleeping through the night (Mc Garr & Hovell, 1980; Jones & Verduyn, 1983; Johnson & Lerner, 1985; Rickert & Johnson, 1988; Mindell, 1999). The theory behind this treatment approach is that the infant is receiving parental attention "contingent upon sleep and for non-crying behaviour, rather than for spontaneous waking and crying" (McGarr & Hovell, 1980, pp176).

4.8 Bed-time routines

Although planned ignoring and its modifications often use various modifications of stimulus control as part of the treatment approach (France & Hudson, 1990), some authors have used bed-time routines alone in treating ISD . This involves using such things as timing of sleeps, place of sleep, and bedtime routines as treatment without leaving the infant to cry at any stage (Weissbluth, 1982; Bidder, Grey, Howells & Eaton, 1986; Seymour, Brock, During & Poole, 1989).

4.9 Group training

This involves educating a group of parents on both the factors that have been found to contribute to the development of ISD and the programme(s) that can be used to treat the problem. Hall and Nathan (1992) looked at the effectiveness of group training in the treatment of ISD. They found that it could be successfully treated using a comprehensive parenting training approach where groups of parents are taught about the development and treatment of the problem, as well as given time to discuss and role play their particular problem and solution.

4.10 Pharmacological treatments

Sedatives are widely prescribed for infants presenting with ISD. The most common form of sedative prescribed are antihistamines like trimeprazine (proprietary name Vallergan), promethazine (Phenergan), and diphenhydramine (Benadryl). Although these forms of medication may be effective in the short term, once the medication is withdrawn there is often no long term effect as the infant has still not learnt to self soothe (Seymour, 1987; Richman, 1985; Jones and Verduyn, 1983). France, Blampied and Wilkinson (In Press) looked at the effect of differing doses of Trimeprazine on the treatment of ISD. They found that there were no clinically significant effects from using the lower dose (15mg/5ml), and that there was no consistent effect of the high dose (30mg/5ml) neither across nor between participants.

4.11 Pharmacological treatment in combination with behavioural treatment

This involves giving the infant decreasing doses of medication while the parents also follow a behavioural programme (France, Blampied & Wilkinson, 1991). An example of this is where an infant is given decreasing doses of trimeprazine (pharmacological) while the parents follow a parental presence programme (behavioural).

4.12 Combination of treatments

Several authors have used a combination of techniques using parts of the ideologies of different treatments and piecing them together to form different techniques (Richman, Douglas, Hunt, Landsdown and Levere, 1985; Scott and Richards, 1990; Seymour, 1987; Mindell and Durrand, 1993; France and Blampied, in press 1999a). For example 'holding' may be used in addition to a parental presence with trimeprazine programme (France, 1999; personal communication). This holding technique may be used if there is an individual case where an infant will not lie down when placed in the cot therefore hindering his/her ability to settle at night. In this scenario the parents could lie the infant down when he/she sits up in the cot and then gently place a hand on the infant's back in an effort to keep the infant lying down. This technique can be used while still adhering to the parental presence with trimeprazine programme.

5. Criticisms of the treatment of ISD

5.1 Informed consent

Before any type of treatment can begin, consent needs to be gained from everyone who is going to be involved in the treatment (France, 1994). One of the major problems that

health professionals working with the families of infants with ISD face is that of informed consent. Infants are unable to give consent and therefore the parents give consent for them. This poses as a problem for some critics of ISD treatment. In defending against this criticism, research has shown that infants are unlikely to "grow out" of their sleep problems and also that ISD may be related to the later development of other behaviour problems and therefore it is in their interest to be treated for the problem. In order to determine whether the infant's sleep behaviour is disturbed, an assessment of both the infant and the family as a whole is done. This assessment is also used to rule out any serious health or family problems that may hinder the implementation and success of the programme. Health professionals need to assist parents in their decision about which, if any, form of intervention they would like to try by,

> "(a) exploring the ISD in the light of the family's cultural heritage and in relation to other more pressing family problems such as marital conflict, parental depression, infant developmental delay, or illness; (b) helping parents answer their concerns about the ethics of intervention by giving full information; (c) presenting all management options with full information on the possible advantages and disadvantages for each, and (d) providing support if parents choose to intervene, in order to maximise the spread, magnitude and duration of change" (France, 1994, pp 106).

5.2 The use of planned ignoring

There are authors who have expressed concerns about the use of planned ignoring-based techniques when treating ISD. Some would argue that infants who are left to cry at night

do not learn to become warm, secure people and that they will feel frightened, rejected and helpless resulting in them having little faith in themselves and their parents. Other authors dispute these claims. France (1991) treated 35 infants using planned ignoring and found no sign of it having led to any deterioration in infant security, likeability and emotionality/tension. On the contrary, she found that it actually resulted in lasting improvements in all of the areas in which the critics predicted deficits.

Often when behavioural techniques used to treat problem behaviours are unsuccessful, the problem does not lie in the technique itself but rather in the way it was implemented. It is therefore very important to ensure that those implementing the programme understand exactly what to do and what sorts of reactions to expect. Drabman and Jarvie (1977) have stated that,

> " ...ignoring has been found to be a viable and useful technique for the control of disruptive behavior(s) in a variety of situations. However, frequently the procedure fails because its users are either not aware of the problems inherent in such a 'simple' procedure or are unable to effectively confront and/or avoid these pitfalls." (pp 82).

Other authors believe that it is goes against parenting 'instincts' to leave an infant to cry as is recommended when using a planned ignoring programme or variation thereof (France, 1994). In opposition to this claim, research has shown that most parents wanting help with their infant's sleep have already left their child to cry at some stage when attempting to deal with the problem on their own. This shows that leaving an infant to cry

seems to be a natural coping strategy that many parents try. (France, 1994). In support of this, Rickert and Johnson (1988) found that 26 out of the 27 parents participating had left their infant to cry at some stage while trying to deal with the problem.

Since many parents do seem to leave their infant to cry at some stage in an attempt to deal with the problem, would it not be better to have a professional implement a tested programme with parents rather than to leave them to incorrectly deal with the problem, possibly making it worse by shaping the infant's crying? France (1994) suggests that many parents try to ignore their infant's crying but do so intermittently and therefore ineffectively. This can lead to the parents "shaping up" the behaviour. If a parent leaves their infant to cry for a long period of time yet eventually attends to him/her, the infant learns to increase the problem behaviour (crying) in order to receive attention. This can lead to an exacerbation of the behaviour and a greater resistance to change. Those parents who follow the ignoring technique correctly often end up discontinuing with the process due to feelings of guilt or through misinterpretation of the PERB, thinking that they are making it worse (France & Blampied, In Press).

Generally there are positive changes for both parent and child after the treatment of ISD. These changes include a reduction in both infant and maternal sleep deprivation, a reduction in other behaviour problems the infant may have, as well as a decrease in maternal malaise. There is also usually an improvement in both the quality and quantity of interactions between parents and their infant (France, 1994).

6. The prevention of ISD

6.1 Parent Training

Since a large body of research has shown that the development and persistence of ISD is closely related to parental behaviour and practices, it has been suggested that it may be possible to prevent these problems by providing parents with information and advice in the post-natal period. Kerr, Jowett and Smith (1996) intervened with 86 families when their infants were 3 months old, informing them of the latest research and trends in ISD. Another 83 families with three month-old infants acted as a control group. The sleeping behaviours of all the 169 infants were compared at 9 months of age. They found that a significantly smaller percentage of babies in the intervention group had settling and night-waking problems than did those in the control group. Therefore by informing parents about the risks and nature of ISD we may be able to dramatically reduce the number of infants that develop it.

Similarly, Wolfson, Lacks and Futterman (1992) randomly allocated first-time parents from child birth classes to two training groups. One group were taught behavioural strategies to promote healthy, self-sufficient sleep patterns and the other group were not. They found that those who were trained in behavioural strategies had infants with better sleeping patterns than did the control infants. Adair, Zuckerman, Baucher, Philipp and Levenson (1992) also looked at the effectiveness of parent training as a form of ISD prevention. They found that at 9 months after the intervention, infants experienced 36% fewer night wakings per week than did the control infants. They also found that frequent night wakings were twice as common in the control infants.

6.2 Co-sleeping

Some authors argue that co-sleeping could be used as a form of ISD prevention and cure. Their beliefs include the idea that co-sleeping is associated with less sleep disturbance in the child as the prevalence of separation anxiety is decreased. In turn it causes less disturbance in the parents' sleep as they are able to respond to their infant with minimal effort and an improvement in parent-child relationships as it leads to closer bonding (Bax, 1980).

Mc Kenna, in McKenna, Thoman, Anders, Sadeh, Schechtman and Glotzbach (1993), has taken an evolutionary approach to the necessity for co-sleeping. He argues, in accordance with Lozoff and Brittenham (1979), that differing species evolve to either cache (nest) or carry their young, and that humans have evolved to carry their infants. Nonprimates who cache their infants (e.g. lions) and only return to them every 6-12 hours, have milk that is high in fat and protein. This enables their young to be satiated for longer periods of time. So the argument is that the composition of human milk and its relatively low caloric density indicates the necessity for frequent feeds and therefore the infant needs to be close to it's mother, even during the night, for nursing.

There is much debate and conflicting evidence about the issue of co-sleeping. Young, Pollard, Blair, Fleming & Sawczenko(1998) studied the safety of co-sleeping, and found there to be no adverse effects. Yet, Mitchell, Taylor, Ford, Stewart, Becroft, Thompson, Scragg and Hassall (1992) have presented contrasting information about the safety of co-

sleeping. In their studies of SIDS (sudden infant death syndrome) they have found that in many cases, co-sleeping was a risk factor these deaths and therefore advocating co-sleeping as a form of prevention for ISD might lead to a higher risk of SIDS in these infants.

There are other authors who do not advocate co-sleeping at all. Lozoff, Wolfe and Davis (1984) looked at the effect of co-sleeping on ISD in an American sample, and found there to be a clear link between co-sleeping and ISD, as parents and infants were waking each other up during the night, infants were usually being breast fed during their wakings, and they were not learning to self soothe. In further support of the argument that co-sleeping is not a viable form of ISD prevention, France (1994) found that half of the parents that came to her clinic wanting help with their infant's sleep problems, were already unhappily co-sleeping.

7. Rationale for the current research

Since ISD is such a commonly occurring problem and not much work has yet been done on its prevention, the main focus of current research in this area is still on its treatment. The focus of the present study is on whether a modified version of a well-established technique used to treat ISD would also be effective. The main aim in using this modified technique is to lower both parental and infant distress while the programme is being implemented.

This study looked at a modification of the incremental graduated planned ignoring (IGPI) approach. It was based on the research done by Mindell and Durand (1993). These investigators had used this programme to treat older children (around 3 years of age) and found it to be successful. Their first assumption was that if parents intervene at bedtime only using the IGPI programme (i.e., leave the child to cry, unattended, for increasing periods of time in response to initial settling difficulties) the child will learn to self soothe. Their next assumption was that once the child has learnt to self-soothe, the child will generalise this skill of self-soothing to subsequent night wakings.

This assumption, namely that treatment at bedtime-only may result in the skills learnt by the child at this time being transferred across to the night wakings, is based on the principle of generalisation. There are two main types of generalisation that may occur as a result of this new "bedtime-only" form of intervention. These are stimulus generalisation and response generalisation. There is a third form, that of treatment generality, which is also involved in the present study. To evaluate the assumption made by Mindell and Durand (1993), and to extend the range of interventions available for the treatment of ISD, it is necessary to consider the nature and processes of these types of generalisation.

7.1 Types of generalisation

7.1.1 Treatment generality

This type of generalisation is said to have occurred when a form of treatment is effective across diverse participants, cultures, settings and behaviours (Stokes and Baer, 1977). Treatment generalisation would occur if the "bedtime-only" intervention used by Mindell

and Durand (1993) were effective in treating the sleep problems of children at different ages, from different cultures and with different problem behaviours. This study is interested in whether treatment generality will occur from the bedtime-only intervention that Mindell and Durand (1993) used to intervene with toddlers, to the use of this same intervention with infants. This could be measured by determining whether the bedtime-only intervention leads to an improvement in the sleep problems of each individual.

7.1.2 Stimulus generalisation

According to Catania (1968) stimulus generalisation involves,

> "the spread of the effects of reinforcement (or of other operation, e.g., extinction, punishment, respondent conditioning) in the presence of one stimulus to other stimuli that differ from the original stimulus along one or more dimensions. To the extent that responding is similar in the presence of two different stimuli, the organism is said to generalize between the stimuli (or the stimuli are said to be generalized). If responding is identical in the presence of one and the other stimulus, generalisation between these stimuli is said to be complete." (pp 335).

Mindell and Durand (1993) did not establish the type of generalisation that occurred in the children's behaviour but their assumption was that it consisted of stimulus generalisation of the child's responses. The child acquired self-soothing skills at bedtime. These skills then generalised to the child's night wakings, where he/she was able to emit self soothing responses under different conditions from those present at the beginning of the night where the self soothing skills were learnt. The conditions at bedtime probably

involved a fairly light room with quite a lot of household noise like the T.V. going or talking. The conditions at night-time involved a dark room and a quiet household. This type of generalisation could be measured by looking whether there is a decrease the number of signalled awakenings in the infant over the intervention period. It could also be measured by looking at whether there is a decrease in the time taken for the infant to resettle and go back to sleep after any signalled night wakings. While Mindell and Durand (1993) suggested the possibility of generalisation in the parents' behaviour following the intervention, they did not formally measure this. However, it can be suggested that if stimulus generalisation had occurred in these parents' behaviour they would have generalised the skills that they learnt through implementing the programme at bedtime, such as leaving the infant to signal for a period of time before attending to him/her and only attending to him/her for a short period of time, and used them when dealing with their child's night wakings.

7.1.3 Response Generalisation

This type of generalisation can be defined as, "the extent to which the learner performs a variety of functional responses in addition to the trained response(s)" (Cooper, Heron and Heward, 1987, pp582). Although Mindell and Durand (1993) did not specify what type of generalisation occurred in the children's behaviour, response generalisation may also have occurred in some of the children. For example, in relation to the self soothing skills he/she learnt at bedtime, he/she may have first only used a pacifier to self soothe and then learnt to also use the blanket or the thumb if the pacifier was not available. Mindell and Durand (1993) did not formally measure whether or not any generalisation occurred in the

parents' behaviour. It could be suggested that if response generalisation did occur in the parents' behaviour they would use similar techniques to those taught through the intervention, but not identical ones, when dealing with their child's night wakings. For example they may decide to always leave the infant to cry for ten minutes before attending to him/her instead of using a graduated time period.

7.2 Hypotheses of the current reseach

The idea that treatment for ISD may only be necessary at bedtime is of great interest to researchers and clinicians because it would lower both infant and parent distress and would also be more cost effective to implement than other well-established programmes. Mindell and Durand (1993) found this "bedtime-only" treatment approach to be effective with children aged around three years. The question for ISD researchers is whether this programme would be as successful with other age groups as it was with the toddlers that they treated.

7.2.1 Hypothesis 1

The first hypothesis of the present study is that treatment generality will occur where the bedtime only intervention will be as successful with infants as it was with the toddlers that Mindell and Durand (1993) studied. This will be done by looking at whether the treatment of ISD at bedtime-only results in a noticeable improvement in the sleep problems of the treated infants.

7.2.2 Hypothesis 2

The second hypothesis of the present study is that the occurrence of stimulus and response generalisation may take place in both the infant's and the parent's behaviour during night wakings. Mindell and Durand (1993) suggested that the generalisation which occurred in their study was in the child's behaviour only. They did address the possibility that generalisation may have occurred in the parent's behaviour, but they did not formally record this. They noted that when they questioned, at follow-up, about any change in their behaviour during night wakings, the parents did not recognise any. The present study will look at whether the stimulus and/or response generalisation only occurs in the child's behaviour or whether it occurs in the parents' behaviour as well. The assumption is that parents will also learn new behaviours when they implement the programme and these may generalise to their behaviour during their infant's night wakings.

CHAPTER 2

METHOD

1.Participants

Seven families with infants aged 6-20 months, took part in this research. The study was conducted in Christchurch, New Zealand. In order to take part in this study, infants needed to have both bedtime (i.e., unable to fall asleep alone in their cot) and night waking problems. The participating families were recruited through advertisements in the local Christchurch newspaper, *The Press,* and on community notice boards (see Appendix 1). This research was done as part of the Canterbury Sleep Programme (CSP) which is a well known sleep research programme within the Christchurch area. The CSP works in conjunction with local medical practitioners and clinics, so some families were referred to the current research through these avenues. All participants were treated at no charge. Individual infant and family characteristics are given in Table 1 below. Each child has been given a pseudonym to ensure anonymity.

Table 1: Demographic characteristics of the participating families

CHILD	GENDER	AGE (months)	BIRTH ORDER	PARENTS RESIDING	SES*
Craig	Male	20	4	1	3
Carl	Male	18	1	1	4
Trent	Male	9	1	2	1
Claire	Female	9	1	2	2
Ingrid	Female	14	1	2	2
Toby	Male	8	1	2	2
David	Male	10	2	2	2

* Family socioeconomic status as rated on the Elly-Irving Scale (Irving, 1991), where 1=highest and 6=lowest.

This table shows that five of the seven infants were first born, five were male and five lived in a two-parent family. All seven infants came from a white, middle class family and met the age criteria for ISD which is between six and twenty-four months.

2. Measures and Materials

2.1 Child Sleep Diaries.

The main data on the infant's sleep was obtained through parent-recorded child sleep diaries. The diaries used in this study were an adapted version of those used by France (1989). They were completed daily by the parent(s) to record information concerning the infant's sleep regime and the interactions between parent and infant. The information that was recorded was the frequency and duration of daytime sleep, the time the infant was

placed in the cot, the duration of time between being placed in the cot and falling asleep, the number, time, and length of any night wakings, the time the infant woke in the morning and the behaviour of parents at bedtime as well as during the night wakings (see Appendix 2).

2.2 Phone calls.

Daily phone calls were made to the parents during the first week of the programme in order to monitor progress, maintain adherence to the programme and give encouragement. After the first week the families were able to decide the frequency of calls they received during the following weeks, depending on their individual needs. All parents were given contact phone numbers of CSP staff so that they could contact help at any time (24hrs), if problems arose.

2.3 Home Visit Videotapes.

In order to measure the reliability of the parent-recorded child sleep diaries, and the adherence of the parents to the programme, the infants were videotaped in their own bed for two nights on one occasion during baseline and intervention. The infra-red time-lapse video system (Anders, 1979; Minde, Faucon & Falkner, 1994) consisted of an infra red light which enabled recording to take place in a dark room, a video camera, a monitor to check that the camera was correctly set up and a video recorder. The camera was placed on a tripod and set up about two meters away from the infants' cots. Due to the use of the time-lapse mode 24 hours of taping could fit on a three hour tape. The time lapse mode

was used to ensure that a full night's observation would be compressed to fit onto one video tape so as to minimise parental contact with the equipment.

Once the equipment was correctly set up the parents were instructed in it's use. They were instructed to treat the recorded nights as usual. If the case arose where the parent(s) removed the infant from the cot, the researcher made it clear that they were to continue filming an empty cot/bed through the entire night and that they should treat the night as naturally as possible. That is, they should continue to record all behaviour and interaction that occurred during the night manually in the child sleep diary. If any circumstances arose that prevented the parents from accurately recording the night's sleep they were to report this to the researcher so that the data were not included in conducting reliability checks. This was done by comparing the videotapes with the diary records of the same nights to check for accuracy of the diaries as well as parental compliance.

2.4 Parent Questionnaires.

To evaluate parental satisfaction with the sleep programme and the service provided by the CSP, parents completed a questionnaire once the programme had concluded (see Appendix 3).

2.5 Generalisation

Five measures of generalisation were executed. First, the incident of treatment generality was determined. The second and third measures look to stimulus and response

generalisation, respectively, in the infant. The fourth and fifth measures examine stimulus and response generalisation in the parents.

2.5.1 Treatment Generality.

The Child Sleep diaries were used to measure treatment generality. If positive changes were seen in the infants' problem sleep-behaviours, as a result of the bedtime-only intervention, then treatment generality was said to have occurred.

2.5.2 Stimulus Generalisation in the infant.

The presence of stimulus generalisation in the infant's behaviour was measured by using the child sleep diary data to determine whether the time it took the infant to resettle after night wakings decreased following the intervention. The assumption was that if settling time after night wakings decreased, the infant was applying the self-soothing skills learnt at bedtime to put him/herself back to sleep after night wakings. The time-lapse videotapes were also used to establish whether or not stimulus generalisation had occurred. If the infant was seen to wake and go back to sleep without signalling and disturbing his/her parents, stimulus generalisation was said to have occurred.

2.5.3 Response generalisation in the infant.

The time-lapse videotapes were used to determine whether response generalisation had occurred. If the infant was seen to resettle him/herself after night wakings using self-soothing skills that differed from those used at bedtime, response generalisation was said to have occurred.

2.5.4 Stimulus generalisation in the parent.

The child sleep diaries were used to determine whether stimulus generalisation had occurred. If the mother began to change her behaviour during night wakings and started using similar behaviours to those used at bedtime, stimulus generalisation was said to have occurred.

2.5.5 Response generalisation in the parent.

The child sleep diaries were used to establish whether response generalisation had occurred. Response generalisation was said to have occurred if the new behaviours used to treat the night wakings were similar, yet not identical, to those used at bedtime.

3. Procedure

3.1 Research Design.

A single case, multiple-baseline across participants design (Cooper, Heron and Heward, 1987) was used to test the effectiveness of the proposed treatment programme in treating infant's sleep problems. This involved treating each family individually and not as a group. Each family was allocated a different baseline period. These were chosen at random by the researcher to avoid possible bias. The method of random assignment was done by blindly selecting a card from a box initially containing nine cards numbered six to fourteen. When the card was removed the number it showed represented the duration of the baseline period. Once selected the card was not returned to the box, this was to ensure a multiple baseline design was adhered to.

3.2 Treatment.

All infants received treatment for their bedtime settling problems first (i.e., going to sleep alone in the cot, at the start of the night). Treatment for night wakings were to begin after a few weeks if it was clear that generalisation had not occurred.

All families were seen four times: at the initial interview, at an initial treatment session in order to implement the programme; immediately following intervention in order to implement the maintenance programme and at follow-up approximately four weeks later. The sequence of intervention with the families was as follows:

3.3 Initial phone call.

When the parents first contacted the CSP asking for help with their infant's sleep they were asked a few questions to specify whether they matched the current research criteria. If they matched the criteria, details of the CSP and the research programme were described, and they were told that there would be no charge for their treatment. After this a time was set up for their initial interview.

3.4 Interview.

The initial interview involved the parent(s) and their infant either coming in to the Canterbury Sleep Programme office or being interviewed in their home. The interview was used to establish a brief history of the infant's general development and family circumstances in order to rule out illness, developmental, and family problems. The development of their sleep problem, and what past and present sleep management

techniques had been tried (see Appendix 4 for interview sheet) were obtained. After this, details of the research project were described again and parents were given a summary information sheet (see Appendix 5). Finally they were asked to sign a research consent form (see Appendix 6).

3.5 Baseline.

This phase began a few days before the Parent Training Session and after it had been established that each family meet the current research criteria. During baseline the parent(s) completed daily sleep diaries for the infant. Diaries were completed for differing numbers of days, depending on the baseline period they had drawn.

3.6 Parent training session.

This face-to-face session was aimed at preparing the parents for the start of the sleep programme. At the start of the training session the completed diaries were checked and the treatment programme was discussed in detail. This involved explaining the rationale behind the programme as well as giving instructions on how to implement the programme.

The session began with an overview of infant sleep patterns in general. Latest research findings about the effect that ISD can have on later child development were discussed. Finally the parents were told that recent research had documented that treating bedtime problems in pre-schoolers appeared to result in improvements in night wakings over the

first few weeks of treatment, and that the CSP was looking to see if this applied to infants as well.

Next the structure of the programme was explained. This involved deciding on a bedtime for the infant and on a half hour nightly bedtime routine (e.g., dinner, bath, quiet play, bed), so that bedtime became predictable for the infant. The infant was to be put to bed while he/she was still awake in order to learn the self-soothing techniques needed for sleep initiation. In addition, an Incremental Graduated Planned Ignoring Programme (IGPIP) was implemented (Mindell and Durand, 1993). This involved the parent(s) leaving the infant to cry for increasing periods of time. For the first two nights of the programme parents initially had to leave the infant to cry for 5 minutes before responding to him/her. After two responses they waited 10 minutes before their third response and 15 minutes for any responses thereafter until the infant settled. On the third, fourth and fifth nights they had to wait 10 minutes before responding for the first time and 15 minutes for any responses thereafter. From the sixth night onwards they waited 15 minutes before all responses. If there was insufficient improvement in night wakings after a few weeks, parents were to be instructed in applying the IGPI programme to night wakings as well.

When responding to their infant after the given time, parents were instructed to limit their time in the room to 30 seconds. In this time they were not to engage in such activities as picking the infant up, feeding, or turning on the lights. Interactions were to be as brief and minimal as possible. All night wakings were to be treated as usual (i.e., the same as before the treatment was implemented) in order to establish whether generalisation effects

occur. Parents were told that treatment for night wakings would begin in a few weeks once the full effect of the bedtime intervention had been ascertained. The programme details were written on a set programme sheet and given to the parents as a record describing what they were to do (see Appendix 7).

Once the programme had been explained to the parents, during the treatment session, they were encouraged to consider difficult situations they might encounter once they started the programme. These situations were addressed and possible strategies were discussed. An example of such a scenario is one in which the parent becomes concerned when the infant's cry changes to indicate pain. A strategy to counter this would be to check the infant and alleviate the situation if necessary.

Finally, all parents were assured that they would be contacted daily by phone for the first week of the programme and from then on as frequently as they would like. They were also given the contact phone numbers of CSP staff and were told that they were available to help them with the programme 24hours a day.

3.7 Post-treatment and Follow-up.

Once the parents were happy with their infant's sleep patterns and decided to stop using the programme a 'parent questionnaire' was sent out for each parent to complete. A final home visit was also done to explain the maintenance programme. This programme was used to help parents preserve their infants' sleeping patterns (see Appendix 8). During this programme parents checked the infant as soon as he/she awoke and cried during the

night. If the parents felt that there was something wrong, they were to attend to the problem before putting the infant back to bed. If there was no apparent problem they were to leave the room and leave their infant to fall back asleep on his/her own. If their infant was unwell or there was a change in his/her routine, a few nights return to the programme may be necessary to re-establish the infant's sleep pattern.

Three months after the programme had been completed, follow up data was collected by sending a daily child sleep diary out to the parents. The diary was filled in for a week and then sent back to the CSP. Once the diary was returned a final phone call was made to wrap up the treatment and make sure that the sleep problem had been successfully resolved at that time.

CHAPTER 3

RESULTS

1. Reliability

1.1 Data entry

To ensure the accuracy of the data entered for analyses from the child sleep diaries, sleep diary information was entered into the computer twice (once each, by two different coders). The entered data was compared and any discrepancies were double-checked and then corrected.

1.2 Videotapes

The videotapes were also coded twice. First all the tapes were coded by one coder, and then a quarter of the tapes were coded again by a second coder. The notes were compared and any discrepancies were checked and the correct data was entered. Coding was done using a form devised especially to check the reliability of the important factors on the child sleep diaries that were particularly relevant to the present study (see Appendix 10 for coder's form). These were the reliability of (1) the parents' recording of settling times and (2) the parents' recording of their behaviour at bedtime and during the night. The reliability was calculated by tallying all of the correct entries and dividing them by the total number of entries that should have occurred in order to get a percentage reliability score. The average reliability across all participants was 90% (see Table 2).

Table 2: Summary of the reliability of parents' recordings in the child sleep diaries

CHILD	RECORDED TIMES	RECORDED BEHAVIOURS
Craig	83%	75%
Carl	100%	100%
Trent	100%	88%
Claire	100%	100%
Ingrid	100%	88%
Toby	77%	50%
David	92%	100%
Mean	*93%*	*86%*

2. Parent Questionnaires

Once the intervention was complete the parents were sent a questionnaire asking them about the intervention programme itself and about the help they received in implementing the programme. Their responses are summarised in Table 3 below (with 1 being the lowest rating and 4 being the highest rating). The 'general help' column represents questions 1, 2, 5, 6, & 7 of the questionnaire, and shows what the parents thought of the help and support they received from the CSP; the 'satisfaction' column represents questions 3, 4, & 8 of the questionnaire, and shows what the parents thought of the sleep programme(s) they had to implement; and the 'stressfulness' column represents question 9 of the questionnaire, and shows how stressful the parents found it when they implemented the programme(s).

Table 3: Summary of responses to the Parent Questionnaire. (1=lowest rating; 4=highest rating)

PARTICIPANTS	GENERAL HELP Maximum help = 4	SATISFACTION Maximum satisfaction = 4	STRESSFULNESS Maximum stress = 4
Craig's mother	4.0	4.0	2.0
Carl's mother	3.6	3.7	1.0
Trent's mother	3.6	3.7	2.0
Trent's father	3.4	3.7	2.5
Claire's mother	3.8	4.0	2.0
Claire's father	3.8	4.0	1.0
Ingrid's mother	4.0	4.0	1.0
Ingrid's father	2.8	3.3	1.0
Toby's mother	4.0	4.0	2.0
Toby's father	----	----	----
David's parents	n/a	N/a	n/a
Mean	3.2	3.4	1.6

This table shows that the parents were generally very happy with the help and support they received from the CSP staff and with the programme itself. Important to note is the fact that most of the parents did not find implementing the sleep programme very stressful, which was one of the aims of implementing a programme at bedtime only.

3. Analysis of data collected by the child sleep diaries, time-lapse videotapes and phone calls.

Out of the 7 participants who took part in the study, five followed the treatment programme as intended by the researcher, but for two the programme had to be adapted as the intended one did not seem to be effective. The results for the five participants who followed the intended programme will be analysed together and those for the other two will be looked at as separate case studies at the end of the section. The results will be discussed in terms of the three types of generalisation expected in this study.

In order to establish whether treatment generality, stimulus generalisation in the infant and/or parent and response generalisation in the infant and/or parent is shown in this study, the daily child sleep diaries and the time-lapse videotapes were used to calculate several indices. The first measure calculated from the child sleep diaries was of the time it took for the infant to fall asleep at the beginning of the night (Initial Sleep Onset Delay, ISOD). The second measure was of the frequency of night waking. The third measure was of the time it took for the infant to fall back asleep after each night waking (Night Sleep Onset Delay, NSOD). The first measure calculated from the videotapes was that of any signs of stimulus generalisation (SG) and response generalisation (SG) in the infant during night wakings.

First, it will be determined whether treatment generality has been shown in this study. Next, the presence or absence of stimulus and response generalisation in the infant's and parent's behaviour due to the intervention at bedtime-only will be established. Following

this, the effects of the intervention on the ISOD, the frequency of night wakings and the NSOD will be discussed individually for each child. Finally the overall group trends for each measure will be discussed.

3.1 Types of generalisation that occurred

3.1.1 Treatment Generality

Treatment generality was shown in this study. The intervention used in this study was the same as that reported by Mindell and Durrand (1993), and was found to be as successful in treating the sleep behaviour problems of infants as it had been with the toddlers previously. It was successful in that, as in the Mindell and Durrand (1993) study, the problem sleep-behaviours presenting before the intervention had noticeably improved by the end of the intervention phase. Although the initial treatment programme and the end result of the present study and that done by Mindell and Durrand (1993) were the same, the generalisation process that occurred as a result of the intervention appears to have been different.

3.1.2 Stimulus generalisation in the infant's behaviour

Analysis of the time-lapse videotapes showed no signs of stimulus generalisation in any of the infants' behaviour. This was because there were no incidences where an infant woke during the night and resettled without disturbing his/her parents. A graphical comparison of the improvements of the ISOD and NSOD was conducted. It showed a lag in the improvements in NSOD in comparison with the improvements in ISOD for Craig, Carl, Trent and Claire. Ingrid's NSOD was lower than her ISOD at the beginning of

treatment as she was left to fall asleep alone at the beginning of the night and immediately breast fed after any night wakings. Her ISODs improved as a result of the intervention at bedtime-only but her NSODs remained constant until the PG occurred in her mother's behaviour. The most noticeable behaviour change in relation to the NSOD of all five infants occurred after the parents behaviour had generalised, one way or another, from that at the beginning of the night to that during night wakings (see Figure 4). This finding shows that the infant's behaviour did not generalise following the intervention at bedtime-only, instead any behaviour change during night wakings was dependent on the parent's behaviour during the wakings.

3.1.3 Response generalisation in the infant's behaviour

Analysis of the time-lapse videotapes showed no signs of response generalisation in any of the infants' behaviour. As a result of the generalisation in their parents' behaviour, the infants were seen to use self-soothing techniques at night-time. However, there was no indication that any of the infants were using different techniques, from those used at bedtime, to self soothe following night wakings.

3.1.4 Stimulus generalisation in the parent's behaviour

Analysis of the child sleep diaries showed that two main types of stimulus generalisation had occurred in the parents' behaviour. These were Parent-initiated Generalisation (PG) and Parent-initiated Generalisation with Therapist Approval (PGTA). Although there were only two types of generalisation that occurred in the parent's behaviour, the actual behaviours used by the parents following this generalisation varied among the parents.

(1) PG was said to have occurred when the parent's behaviours during the infant's night wakings changed to mirror those used with the intervention at bedtime-only in that they began to use strategies that were similar to those used during the bedtime-only intervention, when attending to night wakings. For example, shortly after the intervention at bedtime-only was implemented, Craig's mother began to leave him to cry for 15 minutes before attending to him after a night waking. She only intended to him briefly before leaving the room again and leaving him to cry for fifteen-minute intervals until he went back to sleep. This generalisation occurred without any instructions from the researcher.

(2) PGTA was said to have occurred when the mother approached the researcher and asked whether she could start using the bedtime-only intervention with later night wakings as well. It is important to note that the researcher did not initiate treatment during night wakings. Rather, the mother asked the researcher whether it would be appropriate for her to use the intervention at night as well. The therapist did not tell the mother what to do during the intervention, but therapist approval was always given. This type of generalisation involved the same set of behaviours as PG.

3.1.5 Response generalisation in the parent's behaviour

Response generalisation occurred in all of the parents as none of them used an identical programme to the one they had been instructed to use at bedtime-only. All parents used some modification of this structured set of responses.

3.2 Effects of the treatment on each individual

3.2.1 Effects on Craig

The first type of intervention used with Craig was the bedtime-only intervention which was followed, seven days later, by Parent-initiated Generalisation (PG) by his mother. Craig's mother's PG involved both stimulus and response generalisation. Following each night waking, she would leave him to cry for 15 minutes before attending to him briefly for the first time. She would then attend to him every 15 minutes after that until he went back to sleep.

(1) ISOD. Craig had typically long ISODs during baseline. His durations were variable and tended to decrease over baseline, but continued to exceed 20 minutes at the end of baseline. When the intervention at bedtime-only began Craig showed a post-intervention response burst (or PERB) in which his ISODs exceeded those typical of the last baseline nights to a considerable extent. His ISODs did track downward during the intervention phase although it took 16 nights for durations to be consistently reduced below levels typical of baseline and to reach zero or near zero. A noticeable decrease in his ISODs occurred soon after the Parent-initiated Generalisation (PG). By the end of the intervention phase Craig had shown a treatment effect in regard to his ISOD but the interpretation of the effect is compromised because of the downward trend of his ISOD in baseline. At follow-up, three months later, it was evident that Craig had maintained his treatment gains (see Figure 1).

(2) Frequency of night wakings. Craig had a fairly stable number of night wakings during baseline. When the intervention at bedtime-only was introduced the frequency of his wakes tracked downwards. His mother's PG occurred fairly early on in the intervention

and was again followed by an overall decrease in the frequency of night wakings. By the end of the intervention Craig had shown a treatment effect in regard to the frequency of his night wakings, and follow-up data showed that he had maintained the effect three months later (see Figure 2).

(3) NSOD. Craig had typically low and stable NSODs in baseline. When the intervention was introduced at bedtime-only his NSODs tracked downward, although there was a considerable amount of variability during the first 10 nights. Again the decrease in NSODs was most obvious after his mother's PG. By the end of the intervention phase he showed a treatment effect in regard to his NSOD which was still evident at the three month follow-up (see Figure 3).

3.2.2 Effects on Carl

The first type of intervention used with Carl was the bedtime-only intervention which was followed, twenty days later, by PGTA by his mother. Carl's mother's PGTA involved both stimulus and response generalisation. Following each night waking, she would leave him to cry for 10 minutes before attending to him briefly for the first time. She would then attend to him every 10 minutes after that until he fell asleep again.

(1) ISOD. Carl had zero ISODs throughout baseline as his settling problem was that he settled out of bed, on his mother's breast, and was placed to bed asleep. When the intervention was introduced at bedtime-only he showed a post-intervention response burst in which his ISODs exceeded those typical of the last baseline nights. His reaction to being placed to bed awake rather than asleep continued to manifest in substantial,

variable, and sometimes very long ISOD durations for 13 nights. While the trend in ISOD was downward, only three nights in this phase reached zero or near zero ISODs. When the PGTA occurred in his mother's behaviour, his ISODs became less variable overall and trended downwards towards zero more consistently, but he still showed considerable variability. By the end of the intervention phase Carl had shown a treatment effect in that he was able to put himself to sleep in a reasonably short time at the beginning of the night. Carl's follow-up data were affected by illness. On the last night, when he had recovered from his illness, his ISOD was zero and his mother reported that this was typical of his sleep at that time (see Figure 1).

(2) Frequency of night wakings. The frequency of Carl's wakings was variable during baseline, but there seemed to be a stable trend overall. When the intervention at bedtime-only was implemented, Carl showed little improvement in ISOD form baseline. When the PGTA occurred in his mother's behaviour there was a rapid decrease in the frequency of his night wakings. By the end of the intervention phase he showed a treatment effect which was still evident at follow-up despite his illness (see Figure 2).

(3) NSOD. Although there was some variability in Carl's NSODs during baseline, the general trend was stable. When the intervention was introduced at bedtime-only, he showed a post-intervention response burst where his NSODs exceeded those typical of the last baseline nights to a considerable extent. Carl showed little overall improvement in his NSODs as a result of the treatment at bedtime-only. He again showed a post-intervention response burst after his mother's PGTA. His NSODs showed considerable variability during the first eight days following the PGTA and then tended to be zero or near zero for the remaining seven days of intervention. The apparent effect of the

treatment on Carl's NSOD was not strong. He had a low NSOD during baseline because he was being breastfed back to sleep, yet by the end of the intervention phase he was putting himself back to sleep and so, in actual fact, there was a great improvement in his sleep behaviour. Treatment gains were still present at follow-up despite Carl's illness (see Figure 3).

3.1.3 Effects on Trent.

The first type of intervention used with Trent was the bedtime-only intervention which was followed by PG by his mother. Trent's mother's PG involved both stimulus and response generalisation. She made a number of gradual changes following the generalisation of her behaviour from that present at bedtime to that during night wakings. First she started taking him out of his cot a feeding him with a bottle of water instead of from her breast. Then she began feeding him the bottle while he lay in his cot. Finally she would come into his bedroom and sit next to his cot for a few minutes without attending to him, she would leave the room after about five minutes and return every 15 minutes until he fell asleep again. She did not try to implement any programme after any early morning wakings (from 4am onwards), instead she would take him into her bed where he would sleep until they got up in the morning.

(1) ISOD. Trent had a typically low and stable ISOD at baseline. Trent's ISOD durations rapidly tracked downward during the intervention phase with the first zero ISOD after four nights of intervention and a stable zero or near zero ISOD trend after 12 nights. At this time PG began to occur in his mother's behaviour. By the end of the intervention

phase he had shown a treatment effect in ISOD. At follow-up Trent showed an oscillating pattern of zero ISOD alternating with a delay which was slightly briefer than that typical of baseline (see Figure 1).

(2) Frequency of night wakings. Trent had a fairly stable number of wakings but they did seem to be increasing over the baseline. When the intervention at bedtime-only began the frequency of his night wakings did decrease, but only slightly. His mother's PG did not seem to have any noticeable effect on his night wakings. By the end of the intervention phase there was little evidence of a treatment effect. At follow-up three months later, however, the frequency of his night wakings had decreased from that at the end of the intervention (see Figure 2).

(3) NSOD. Trent had steadily increasing NSODs in baseline. When the intervention was introduced at bedtime-only, his NSODs tracked downward although there was some variablity. The decrease in his NSODs was most obvious after the PG in his mother's behaviour. By the end of the intervention phase there was a clear treatment effect in his NSODs. At follow-up he showed an oscillating pattern on NSODs indicating some recovery of sleep disturbance (see Figure 3).

3.1.4 Effects on Claire

The type of intervention used with Claire was first the bedtime-only intervention which was followed by PGTA by her mother. Claire's mother's PGTA involved both stimulus and response generalisation. Following each night waking, she would leave Claire to cry for 5 minutes before attending to her briefly for the first time. She would then attend to her every 10 minutes until she fell asleep.

(1) ISOD. Except for the first baseline night, Claire had zero ISODs throughout baseline as her settling problem was that she settled out of bed, on her mother's breast, and was placed to bed asleep. When the intervention at bedtime-only began she showed a post intervention response burst in which her ISODs exceeded those typical of the last baseline nights to a considerable extent. Claire's ISODs rapidly track downward during the intervention phase, to reach zero or near zero. The PGTA in her mother's behaviour was followed by a maintenance of her zero or near zero ISODs. By the end of the intervention phase Claire had shown a treatment effect in that she was able to put himself to sleep in a reasonably short time at the beginning of the night. At follow-up, three months later, Claire's ISODs had improved (see Figure 1).

(2) Frequency of night wakings. While the frequency of Claire's night wakings was variable, the general trend was stable. When the intervention was introduced at bedtime-only Claire showed little change in the frequency of her night wakings. When the PTGA occurred in her mother's behaviour there was a rapid decrease in her number of wakes, although this was interrupted by illness. By the end of the intervention phase Claire showed a marked treatment effect which was still apparent at follow-up three months later (see Figure 2).

(3) NSOD. Although there was some variability in Claire's NSODs during baseline, the general trend was stable and seemed to be decreasing slightly. When the intervention at bedtime-only began there was a decrease in her NSODs. Once the PGTA occurred in her mother's behaviour, her NSODs rapidly decreased to zero or near zero durations. By the

end of the intervention Claire showed a treatment effect which had improved further at the three month follow-up (see Figure 3) .

3.1.5 Effects on Ingrid

The first type of intervention used with Ingrid was the bedtime-only intervention which was followed by PG in her mother's behaviour. Ingrid's mother's PG involved both stimulus and response generalisation. Following each night waking, she would leave Ingrid to cry for 10 minutes before attending to her briefly for the first time. She would then attended to her every 10 minutes after that, until she fell asleep again.

(1) ISOD. Ingrid had typically long ISODs during baseline. Her ISODs were initially stable in baseline and while these became more variable later in baseline they continued to have a stable trend overall. When the intervention was introduced at bedtime-only, her ISODs tracked steadily downward. Once the PG occurred in her mother's behaviour her ISODs improved further and remained at zero or near zero. By the end of the intervention phase Ingrid had shown a treatment effect in ISOD which, despite her illness, was still present at the three month follow-up (see Figure 1).

(2) *Frequency of night wakings.* Ingrid had a stable number of wakes during baseline for the first five nights and then again for the remaining seven nights. There was a significant increase in the number of wakings in the remaining seven nights and therefore an increasing trend was apparent. When the intervention was introduced at bedtime-only, the frequency of Ingrid's night wakings decreased dramatically. The PG in her mother's behaviour was followed by a maintenance in her low, stable number night wakings. By

the end of the intervention phase Ingrid had shown a treatment effect which, despite her illness, was still present at the three month follow-up (see Figure 2).

(3) NSOD. Ingrid had typically long NSODs in baseline, and her durations were variable and tended to increase over baseline. When the intervention was introduced at bedtime-only there was a dramatic decrease in her NSODs. The PG in her mother's behaviour was followed by a further decrease in her NSODs and the maintenance of a trend of a zero or near zero durations. By the end of the intervention she had shown a treatment effect which, despite her illness, was still evident at the three month follow-up (see Figure 3).

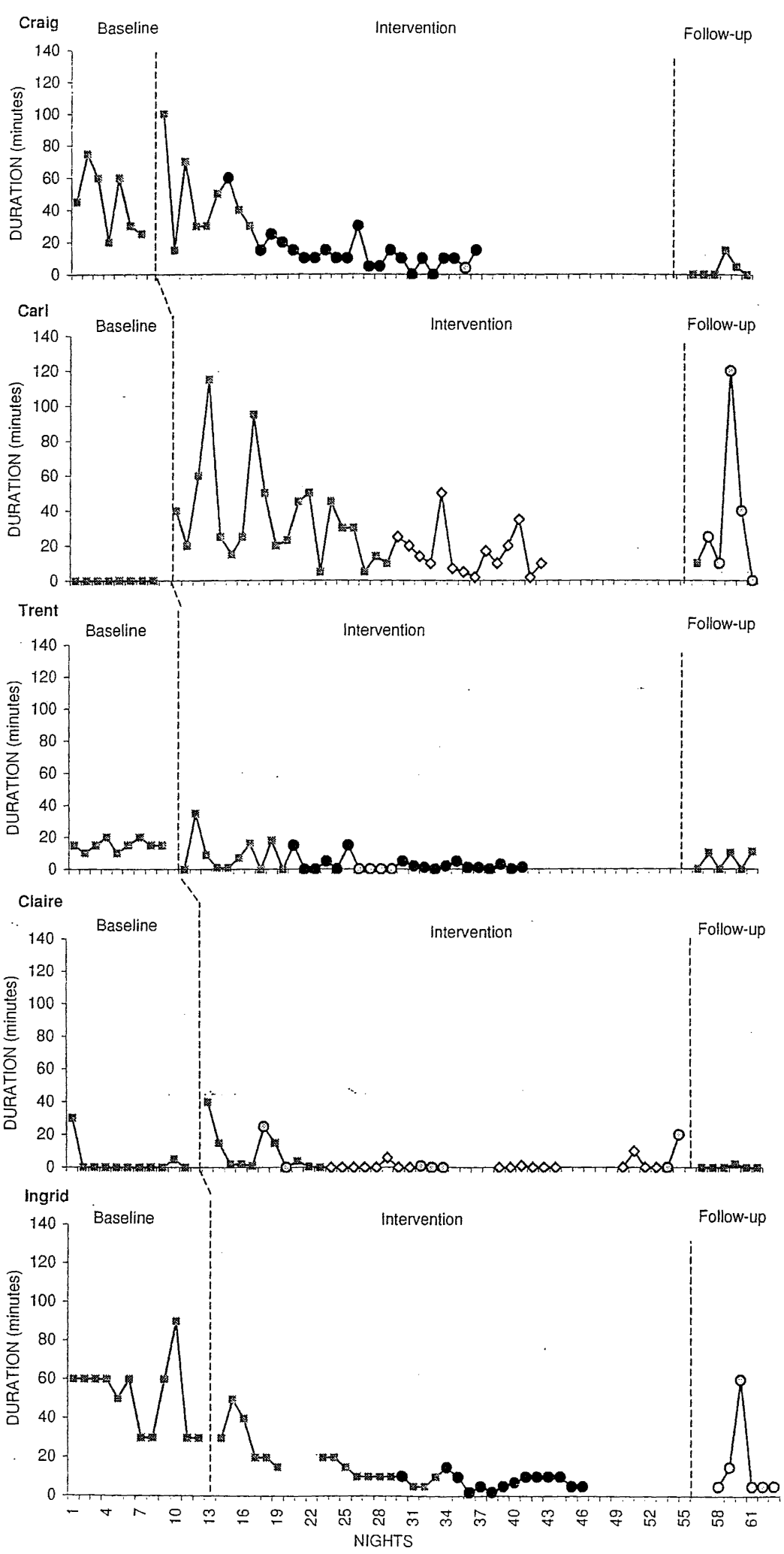

Figure 1: Graphs showing the change in ISOD, for participants 1-5.

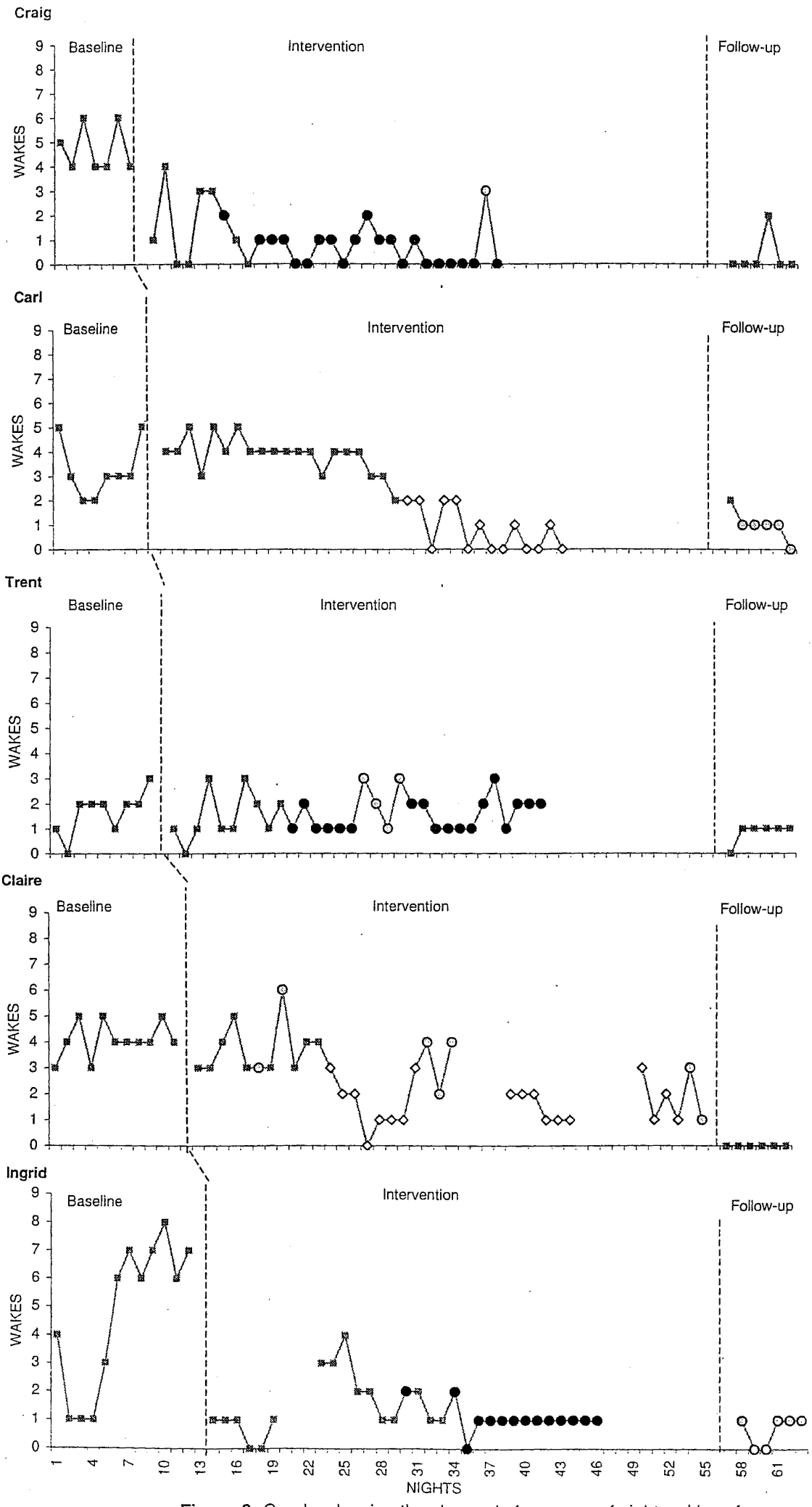

Figure 2: Graphs showing the change in frequency of night wakings for participants 1-5.

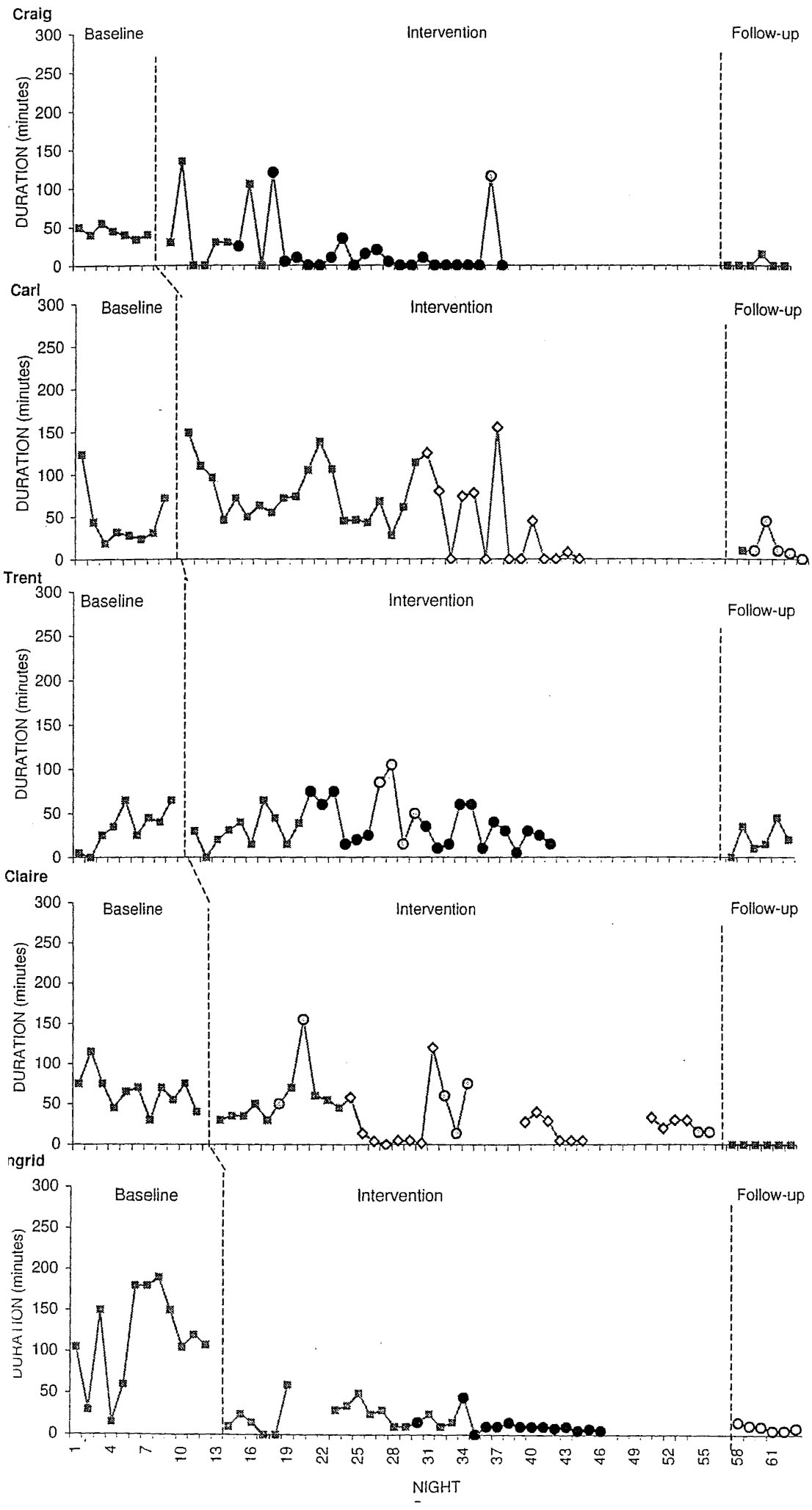

Figure 3: Graphs showing the change in NSOD for participants 1-5.

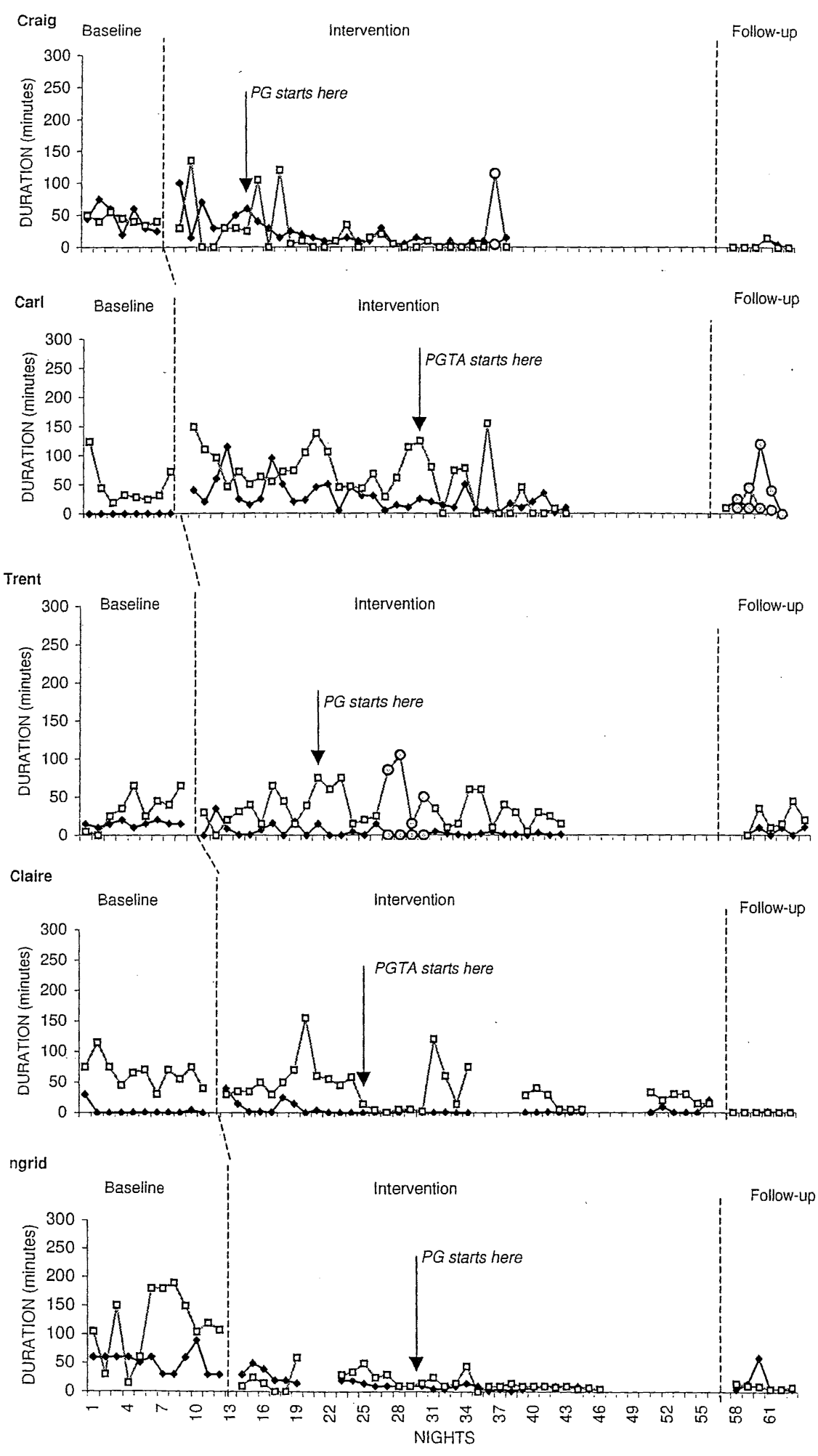

Figure 4: Graphs showing the change in both the ISOD and the NSOD for participants 1-5.

3.2 The overall effect of the treatment on the group

In order to analyse the overall trend in the sleep behaviour of participants 1-5, as a result of the intervention, the means (M) and standard deviations (SD) of the last 6 days in each phase will be discussed and shown in Tables 4-6 below. Table 4 represents the change in ISOD, Table 5 represents the change in the frequency of night wakings and Table 6 represents the change in NSOD.

Table 4: Summary of the changes in ISOD for Participants 1-5.

CHILD	BASELINE		INTERVENTION		FOLLOW-UP	
	M	SD	M	SD	M	SD
Craig	46.33	20.66	8.00	5.70	3.33	6.06
Carl	0.00	0.00	15.43	12.68	34.17	44.31
Trent	15.83	3.76	1.00	1.22	5.17	5.67
Claire	0.83	2.04	6.00	8.94	0.33	0.82
Ingrid	45.00	25.10	8.00	2.74	15.83	22.00

In baseline, Craig, Trent and Ingrid all had long average settling times, exceeding 15 minutes. Carl had zero settling time as he was being placed in bed asleep during baseline. Claire had a near zero ISOD as she was usually put to bed asleep or rocked to sleep. The results from this table show a marked decrease in average ISOD, from the end of baseline to the end of the intervention, for Craig, Trent, and Ingrid. Carl and Claire show a significant increase as they had to be put to bed awake to fall asleep alone in the cot. Follow-up data show a further decrease in Craig, and Claire's ISODs. Tent shows an

overall increase in ISOD although his settling time oscillated between zero and 15 minutes. Carl and Ingrid showed an increase in their ISODs during follow-up, but both infants were ill during this phase and their parents reported that this was not representative of their sleep behaviour at the time.

Table 5: Summary of the changes in the frequency of night wakings, for Participants 1-5.

CHILD	BASELINE		INTERVENTION		FOLLOW-UP	
	M	SD	M	SD	M	SD
Craig	4.83	0.98	0.6	1.34	0.33	0.82
Carl	3.00	1.10	0.4	0.55	1.00	0.63
Trent3	2.00	0.63	2.00	0.17	0.83	0.41
Claire	4.17	0.41	1.62	0.89	0.00	0.00
Ingrid	6.83	0.75	1.00	0.00	0.67	0.52

The results in this table show a marked decrease in the average number of wakings from the end of baseline to the end of the intervention, for Craig, Carl, Claire and Ingrid. Trent showed no noticeable change. The average follow-up data showed an increase in the frequency of night wakings for Carl. He was ill during this phase, and at the follow-up interview his mother reported that the data is not representative of his sleep behaviour at the time, and that he was generally sleeping through the night. Craig and Ingrid had similar data to that at the end of the intervention. Trent and Claire showed improvements in their frequency of night wakings, at follow-up.

Table 6: Summary of the changes in NSOD for Participants 1-5.

CHILD	BASELINE		INTERVENTION		FOLLOW-UP	
	M	SD	M	SD	M	SD
Craig	42.00	7.62	23.00	51.53	5.00	12.25
Carl	34.33	19.06	10.60	19.54	47.83	44.79
Trent	45.83	16.25	21.00	10.84	26.00	18.33
Claire	56.67	18.35	21.81	7.33	0.33	0.82
Ingrid	142.17	36.93	57.00	2.12	25.00	23.01

The results of this table show a marked improvement in the average NSOD from the end of baseline to the end of the intervention, for all five infants. Follow-up data show a further decrease in NSODs for Craig, Claire and Ingrid from that at the end of the intervention(s). Trent showed no significant change at this phase and Carl showed an increase in NSOD yet again he was sick during this phase and his mother reported that this was not representative of his sleep behaviour at the time.

4. Analyses of variance

Although null-hypothesis testing via an analysis of variance (ANOVA) is not required when analysing single case research, ANOVAs were reported by Mindell and Durrand (1993) and therefore have been performed on this data for comparison purposes. The results are reported in the Appendix (see Appendix 10).

5. Separate case studies

As mentioned above, participants 6 and 7 required additional interventions as the initial programme was ineffective. These will now be discussed individually.

5.1 Effects on Toby

(1) ISOD. Toby had variable ISODs in baseline with either long or zero settling times. On the nights with zero settling time, he had been put to bed asleep. When treatment was introduced at bedtime only, his ISOD increased dramatically which lead his parents to be non-adherent to the programme. A 'Shaping' programme was introduced at bedtime only, where his mother would stay in the bedroom and attend to Toby until he fell asleep in his room, as during baseline he had been falling asleep in the lounge or in his parents' bed. A rapid decrease in his ISODs resulted from the 'Shaping' programme. His parents then felt ready to try the IGPI programme again. It was decided that they would implement the programme at bedtime as well as throughout the night. Again his parents found it difficult to adhere to this programme as Toby's ISODs were still long, although they were considerably shorter than those during the original intervention. It was then decided that his parents would try the 'Parental Presence' programme (described in chapter one) which resulted in an ISOD of zero or near zero from the second night on. Once his parents were happy with his sleep behaviour they were ready to use the 'Planned Ignoring' programme (described in chapter one) as the final step to getting him to sleep through the night alone. Toby showed a post-intervention response burst at the start of the intervention but his ISODs soon returned to being zero or near zero.

By the end of the treatment phases Toby had shown a treatment effect from those nights in baseline where he was not put to bed asleep. Follow-up data show that he had maintained treatment gains 3 months later (see Figure 5).

(2) Frequency of night wakings. The frequency of Toby's night wakings was variable during baseline and trended upwards. When treatment was introduced at bedtime only, there was no change from the number of wakes in the last days of baseline, except for on the second night. When the shaping programme began the number of wakes became more variable, yet overall not much improvement was evident over baseline. As a result of the intervention at bedtime as well as during the night, there was a decrease in the number of wakes even though his parents had not adhered strictly to the programme. The parental presence programme resulted in an overall increase in the number of wakings from those during the previous intervention, although Toby was ill and his parents did not follow the programme.

Four days after the planned ignoring programme had been implemented he slept through the night with out any wakes, then every two nights for the following four days. His wakes then remained fairly stable with only one early morning wake in the following twelve out of fifteen nights. Wakes then dropped to zero for the remaining nights except the third to last and last day of intervention.

By the end of the treatment phases Toby had shown a treatment effect. Follow-up data were very similar to those during the last days of intervention. Early morning wakes were

still common and his parents were not adhering to the maintenance programme during this phase as they would take him into their bed after these wakings (see Figure 6).

(3) NSOD. Toby's NSODs were variable during baseline and trended downward. When treatment was introduced at bedtime-only, there was an initial post-intervention response followed by a drop for two days and then a night of very long NSOD. Due to the non-adherence of his parents it is difficult to account for this variability. The NSOD following the shaping programme was almost zero on the first night and then almost six hours on the second night, again the non-adherence of his parents makes these extremes difficult to interpret in light of the implemented programme. Although there was an upward trend during the remaining five days of the programme the overall trend was lower than that at baseline. The IGPI programme implemented at bedtime and through the night, resulted in an overall increase in NSOD, although there was again variablity in the data. There were oscillating long and short NSODs at the start of the parental presence programme but they trended downward overall, with a few disruptions due to illness. The planned ignoring programme resulted in a fairly rapid decline in NSODs although again there was variability in the data. After 12 nights his NSODs were consistently zero or near zero.

By the end of the treatment phases Toby had shown a treatment effect. Follow-up data indicate an increase in NSODs, yet his parents did not adhere to the maintenance programme (see Figure 7).

5.2 Effects on David

(1) ISOD. David had zero ISODs during baseline as he was always put to bed asleep. When treatment was introduced at bedtime-only his ISODs were typically long but trended downward. While a second intervention using medication was organised a second baseline period was initiated where again there was no ISOD as he was again being put to bed asleep. The second intervention was the 'Parental Presence with Holding and Trimeprazine' programme (described in chapter one). During this programme zero or near zero settling times were typical. This pattern remained stable once the medication was stopped and a 'Parental Presence with holding' programme (described in chapter one) was used . Despite all of the long breaks, due to David's illness and family holidays, there were further improvements in David's ISODs during the 'Parental Presence' programme, which was the final intervention that was used. No follow-up data was collect for David as he was often unwell and still not eating solids at 14 months of age. It was decided that his family should stop the sleep programme and be referred on as the sleep behaviour had become a secondary issue to that of his illness (see Figure 8).

(2) Frequency of night wakings. The frequency of David's night wakings in baseline was variable, yet high. When treatment was introduced at bedtime only the number of wakes remained similar to that at baseline at first and then became stable at 4 wakes per night. For baseline two, the number of wakes remained consistently lower than those in baseline one. There was an improvement in the number of wakes following the parental presence with holding and Trimeprazine programme. As the dose was decreased over time, by one seventh per day, the number of wakes tended to increase. The number of wakes remained

variable and typically high throughout the parental presence with holding, and the parental presence programmes (see Figure 9).

NSOD. David's NSODs at baseline was stable and tended to be about 50mins. When treatment was implemented at bedtime only, there was an overall increase in NSODs, although the increase was only slight. During the second baseline period his NSODs oscillated between 50 and 100 minutes with little improvement overall. Following the introduction of the parental presence with holding and Trimeprazine programme his NSODs tended to be longer but soon decreased and became shorter yet still with great variability. His NSODs decreased and remained at zero or near zero during both the parental presence and holding and the parental presence programmes (see Figure 10).

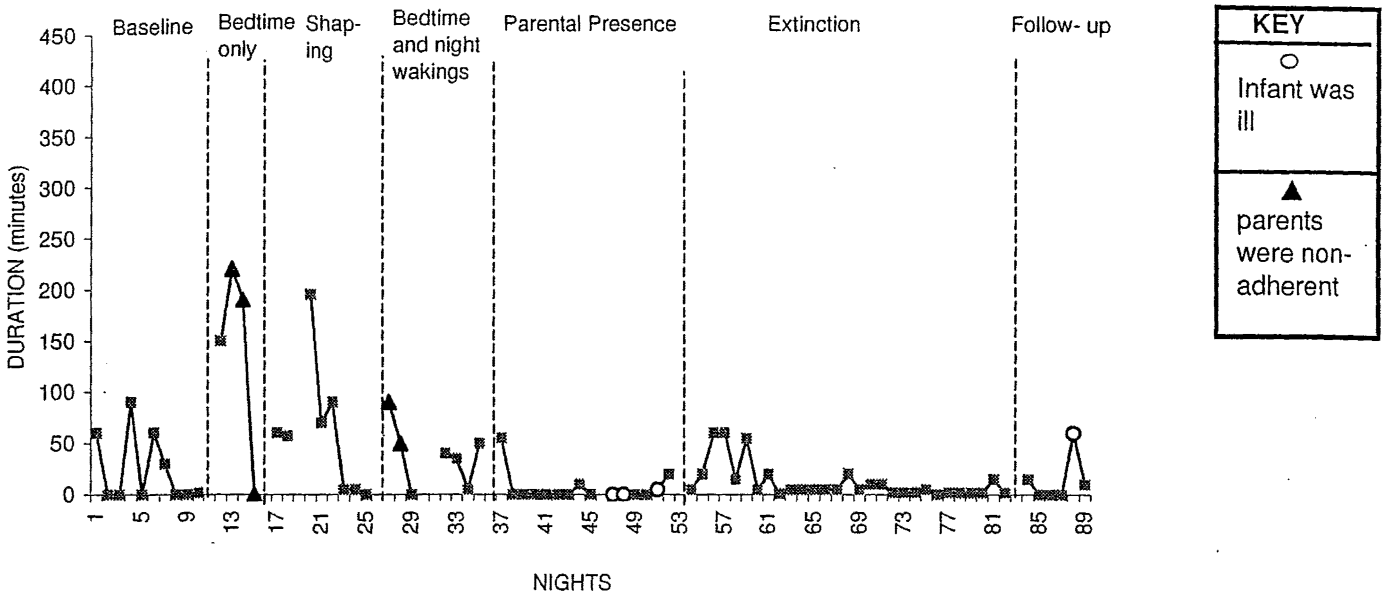

Figure 5: Graph showing the change in ISOD, for Toby

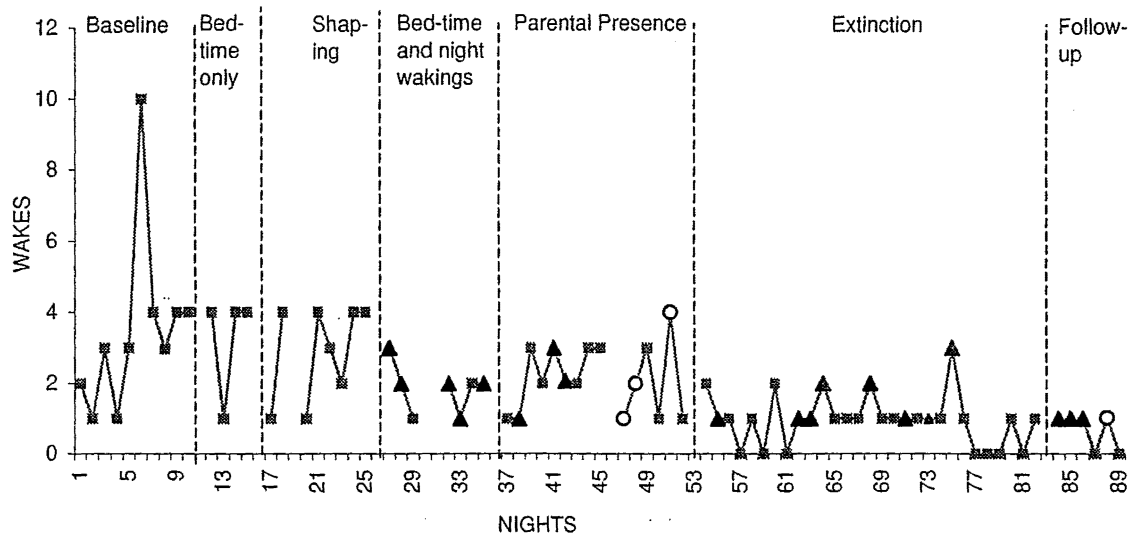

Figure 6: Graph showing the change in the frequency of night wakings, for Toby

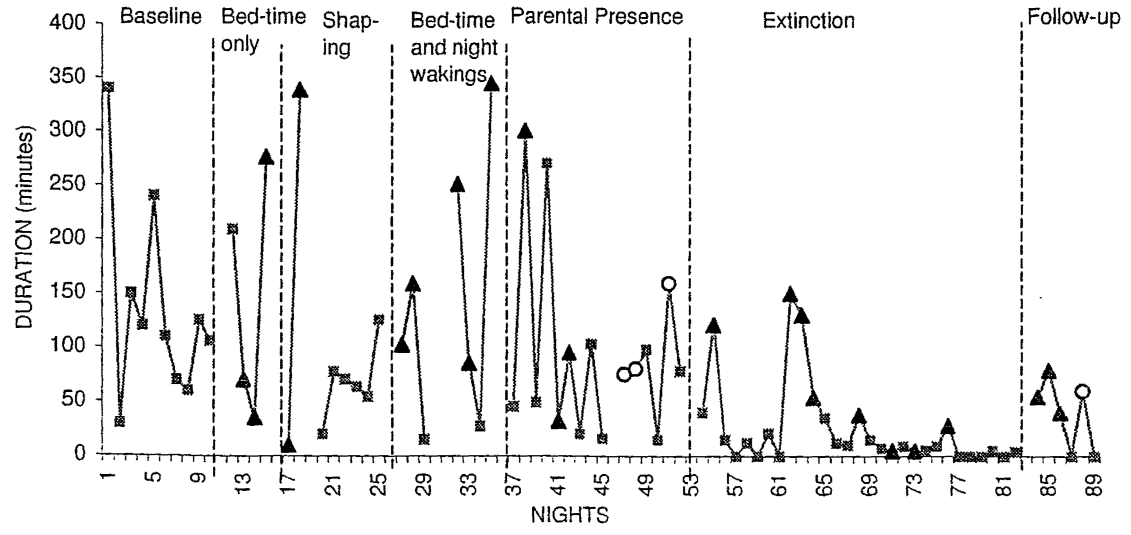

Figure 7: Graph showing the change in NSOD, for Toby

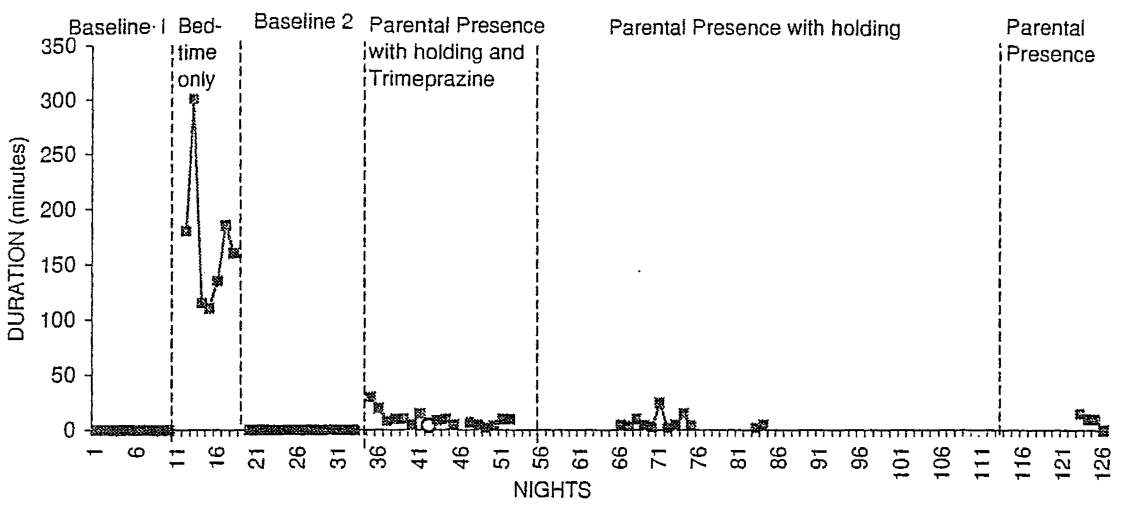

Figure 8: Graph showing the change in ISOD, for David

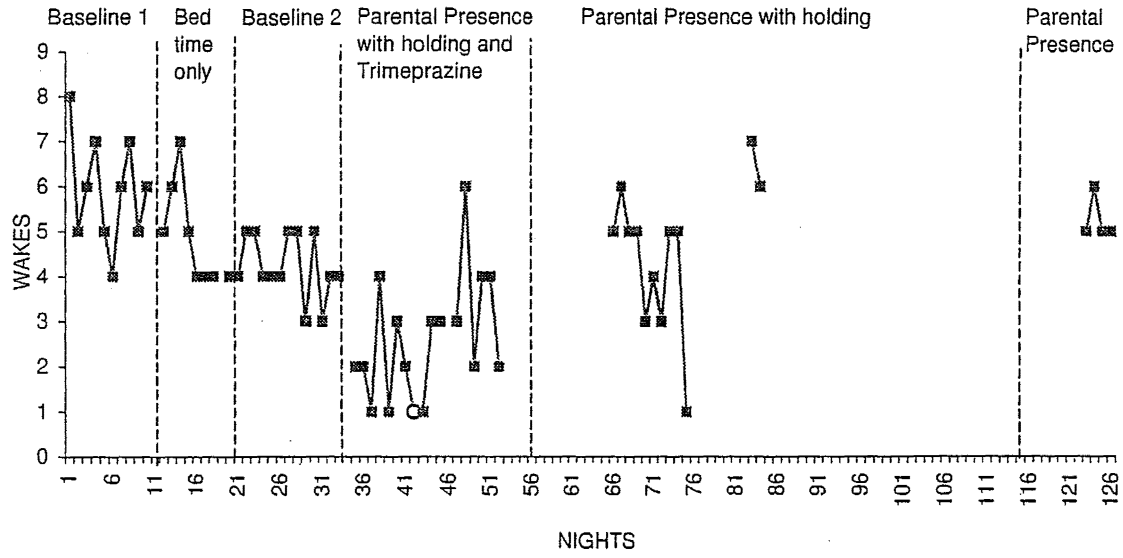

Figure 9: Graph showing the change in the frequency of night wakings, for David

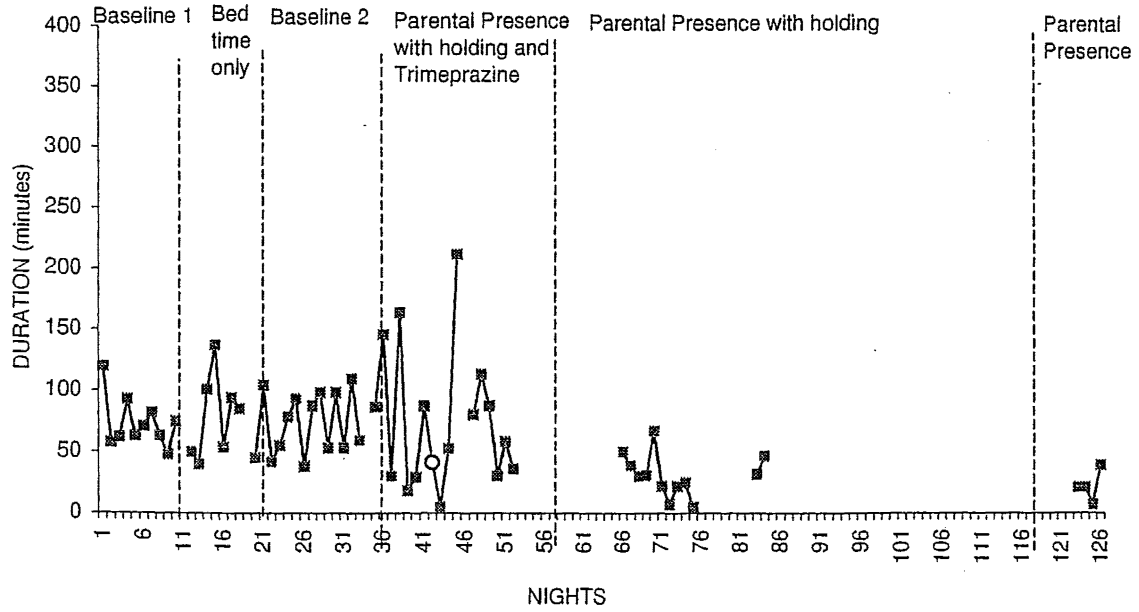

Figure 10: Graph showing the change in NSOD, for David

CHAPTER 4

DISCUSSION

Due to the fact that only five of the seven participants followed the intended programme, the results of Participants 1-5 will be discussed together and those of Participants 6 and 7 will be discussed separately. The results for Participants 1-5 will be discussed in terms of the two hypotheses of this study. The first hypothesis was that treatment generality would occur. The second hypothesis was that stimulus and response generality would occur in both the infant's and the parents' behaviour.

1. Summary of the results for Participants 1-5

1.1 Hypothesis 1

The results of this study show that the use of an incremental graduated planned ignoring programme, at bedtime only, was effective in treating the sleep problems of participants 1-5 and therefore that treatment generality was shown. As a result of the intervention, there were clinically significant decreases in (1) the ISODs, (2) the frequency of night wakings and (3) the NSODs for all participants. Craig and Ingrid both showed a marked decrease in ISOD, NSOD and in the frequency of their night wakings, as a result of the intervention. Carl and Claire both showed a marked decrease in NSOD and the frequency of his night wakings, as a result of the intervention. The results regarding the change in their ISOD are misleading. There could be no improvement in the actual time that these two infants took to settle at the beginning of the night because they were put to bed asleep

during baseline and therefore had zero duration for ISOD. By the end of the intervention they both also had zero ISOD but the treatment effect was that they had learnt to self-soothe and put themselves to sleep at the beginning of the night. They no longer needed to be fed to sleep. Trent showed a marked decrease in ISOD and NSOD as a result of the intervention. The frequency of his night wakings improved from a mean of two wakes per night in baseline to a mean of one wake per night during the intervention phase. The persistence of the one night wake was due to a decision made by his parents. They were happy to co-sleep with him after early morning wakings and decided not to attempt any change in behaviours during night wakings that occurred after 4am.

Hypothesis 2

The success of the intervention at bedtime-only, rested on the generalisation that occurred in the parents' behaviour. Noticeable improvements in ISOD, the frequency of night wakings and NSOD occurred following either PG or PGTA by the mothers, which involved both stimulus and response generalisation. No generalisation was found to have occurred in the infants' behaviour.

2. Interpretation of the results for Participants 1-5

2.1 Hypothesis 1

The use of the IGPI programme and its success in treating ISD has been documented in many other studies (Jones & Verduyn, 1983; Rolider & Van Houten, 1984; Rickert & Johnson, 1988; Adams & Rickert, 1989; Seymour, Brock, During & Poole, 1989; and Durand & Mindell, 1990). The treatment of ISD at bedtime-only, however, has been

reported in only one study conducted by Mindell and Durand (1993). In accordance with their results this study found that the treatment of ISD at bedtime-only can be used effectively to treat sleep problems both at bedtime and through-out the night. These results show that the ISOD, frequency of night wakings, and NSOD of both infants' and toddlers' sleep problems can be reduced by intervening with them at bedtime-only.

Hypothesis 2

The suggested reasons why the bedtime-only treatment was effective in this study differ from those proposed by Mindell and Durand (1993), in that the type of the generalisation was different. In their study they hypothesised that skills and behaviours acquired by the child at bedtime would generalise to the child's night-time behaviours. They suggested that because the children would learn self-soothing techniques through the intervention at bedtime, they would then learn to use these techniques to put themselves to sleep when they woke at night. Mindell and Durand (1993) interpreted their results as confirming their hypothesis.

Analyses of the child sleep diaries and the time-lapse videotapes showed that it was only the parents' behaviour that generalised as a result of the treatment at bedtime-only. A reason why the generalisation may have only occurred in the parents' behaviour is because the parents were quickly rewarded for their new behaviour at bedtime. By the fifth day, on average, the parents were starting to notice a substantial improvement in their infant's bedtime behaviour. Hence, it is plausible that this reinforcement lead the

parents' behaviour to generalise, in one of two ways (PG or PGTA), from bedtime to night-wakings in an average of thirteen days from the start of the programme.

In relation to the findings of the present study, it is possible that generalisation may have occurred in the infant's behaviour if the parents had been instructed not to use the programme at night. The rapid generalisation in the parents' behaviour may have prevented the infants from having time to generalise their behaviour. Mindell and Durand (1993) did not specify what the instructions given to the parents regarding night wakings were. They may have explained the need to continue the same routine during night wakings more than was done in the present study. If the parents in Mindell and Durand's (1993) study did not change any of their night-time behaviours during the intervention phase they would have left more time for the infant's behaviour to generalise.

3. Summary of results for participant 6

Toby's parents found the IGPI programme too stressful and difficult to adhere to as he would cry for very long periods of time when they attempted implementing the programme.

Following this, a combination of four sleep programmes were used in order to gradually treat his sleep problems. By the end of the last programme, the planned ignoring programme, Toby was settling with very low ISODs and sleeping through the night without disturbing his parents. The follow-up data, collected three months later, showed that his sleep behaviour was still good even though his parents were not adhering to the maintenance programme.

4. Summary of results for participant 7

David's parents also found the IGPI programme ineffectual. David really resisted the programme and sat up crying for long periods of time before falling asleep while still sitting up. He would wake and cry again as soon as the parents tried to lie him down, or he would wake up after falling over from sleeping while sitting up. It was suggested that the parents try raising the end of the cot so that he would find it difficult to sit up but he just moved up the cot a bit and still sat up. Following this, three sleep programmes were used to treat his sleep problems. There were marked improvements in David's sleep behaviour from baseline to the end of the interventions. Improvements were seen despite the fact that there were long periods where the programme was not being implemented as either the family went on holiday or David was unwell. No maintenance programme was implemented after treatment because David was still not eating solids at 14 months and was quite unwell. It was instead decided that David's parents should stop the sleep programme and be referred back to the doctor as the sleep behaviour had become a secondary issue to that of his illness.

5. Interpretation of the results for Participants 6 and 7

The intended programme was not successful in treating both Toby and David although they both responded, to some extent, to individual programmes. There are three suggested reasons why these infants did not respond well to the intended treatment programme. The first is that too many controlling variables were being changed at once with the start of the intervention. Both of these infants' had cues associated with bedtime that included

being either in the lounge or in the parent's bedroom and being breastfed to sleep. The start of the intervention involved removing all of the previously learnt bedtime cues and expecting the infants to fall asleep unaided in their bedroom and in a cot. This change may have been too drastic for these infants and therefore they did not respond well to the programme.

The second possible reason why the intended programme did not work with these infants is that all humans have different individual characteristics. Any one programme will not necessarily suit all families. The third possible reason is that in both families the fathers were detached from the programme. Neither father was against doing a sleep programme, but both did not become involved in the process at all. The mothers had to implement the programme alone with little support from their husbands. For the five infants with whom the treatment was successful, Trent, Claire and Ingrid's families were two-parent families with supportive fathers. Craig and Carl's families were one-parent families where the mother implemented the programme alone, as did the mothers of Toby and David. It is suggested that these situations are different because Toby and David's mothers may have expected some support from their husbands and when this was not evident they may have become more stressed and less interested in following the programme. Craig and Carl's mothers did not have partners and therefore expected to implement the programme on their own.

6. Limitations of the present study

6.1 Generalisability

A major limitation of this study is that the participants were demographically similar. They were all white, middle class, New Zealand families. This makes generalisation to diverse families difficult as families from different cultures and SES were not included.

6.2 Parental reports

One possible limitation of this study is that most of the data was collected through the child sleep diaries. Some authors are sceptical of the accuracy of parent reports (Sadeh 1994, Sadeh, 1996). Sadeh (1996) reported a study looking at the accuracy of parents reports and found that parents were accurate when reporting sleep-schedule measures (i.e., sleep onset and sleep duration). They were however less accurate in assessing sleep quality measures (i.e., continuity or fragmentation of sleep and sleep depth). Since this study only asked parents to record sleep-schedule measures, Sadeh's (1996) research actually shows that the parent-recordings in the child sleep diaries are likely to be accurate. In further support of the accuracy of parent recording in the child sleep diaries, France and Hudson (1990) used a voice-activated relay system as a reliability measure in their study and found an agreement of 91% with parental diaries. Mindell and Durrand (1993) also found that the reports in the sleep diaries correlated highly with that shown on the videotapes they had used during their programme ($r=0.88$). In the present study steps were taken to measure the accuracy of the child sleep diaries. Regular phone calls were made to the parents throughout the programme. Notes taken during these phone calls were compared with the sleep diary filled out on that day as a further measure of

reliability. Also, videotapes were compared with the sleep diaries and a 90% agreement was found. Although the agreement was high there is still the possibility of a bias in these results. The parents were aware that the night was being videotaped. They were not specifically aware of the purpose of the taping (i.e., as a reliability check) but they may still have tried to be especially accurate on the videotaped nights and this may have inflated the reliability calculations.

6.3 The manner in which the intervention was explained to parents.

As Mindell and Durand (1993) did not specify in their article exactly what they told parents to do or not to do during the night wakings, the instructions given to the parents in this study may have varied somewhat from those given by Mindell and Durand (1993). In this study parents were told that they could treat the night wakings in any manner that they preferred. Mindell and Durrand (1993) may have specified that they had to carry on doing exactly what they had been doing during baseline. This distinction is important because the direction of the generalisation in this study was not the same as that in the original study by Mindell and Durrand (1993). Since this study was intended as a direct replication of the Mindell and Durrand (1993) study, this lack of clarity over what the parents were told at the start of the intervention limits the ability to compare these two studies. This may also have lead to the conflicting results in regard to the direction of the generalisation. Future research in this area would need to specify more clearly exactly what the parents are told at the beginning of the intervention to ensure that the different directions of generalisation can be accounted for.

7. *Implications for future research*

7.1 Less stressful than other treatment techniques

Since a main focus of the research into the treatment of ISD is on reducing the amount of infant and parent distress experienced during the programme, the present study and that of Mindell and Durand (1993) bring to light a new treatment approach that has been rated by the parents as not being very stressful. Although the parents who followed the intended programme did not find the programme very stressful, no specific comparison was made between this programme and any other established sleep programmes. An important factor to address in future is the degree to which this programme is less stressful than other programmes by measuring the amount of infant and parental distress experienced during the intervention and comparing it with that experienced in other ISD treatment programmes. Another interesting point to research in the future is whether the instructions given to parents, about what to do during their infant's night wakings, determines the direction of the generalisation that occurs (i.e., does it occur in the infants, parents or both).

7.2 Implementing this technique using other sleep programmes

Another issue to address in the future use of ISD treatment at bedtime only is that of programme compatibility. As two of the families in the present study were unable to comply with the intended programme, future research could focus on using different established sleep programmes at bedtime only which may be more individually suited to each family. This would involve asking questions during the initial interview that would

give the health professional an indication of which programme would best suit each family

7.3 Long-term effects of ISD treatment

In order to establish the long term effects of the successful treatment of ISD with a bedtime-only intervention, longitudinal studies could be run in order to first see how effective the bedtime-only treatment is over time and also to see whether any of the behavioural problems found to be associated with ISD still occur with the same frequency once these infants have been successfully treated for their sleep problems.

7.4 Decrease in the factors related to ISD

If the behaviour problems do seem to be less frequent as a result of successful ISD treatment with a bedtime only intervention, it would then be important to establish whether this was due to the child's ability to sleep through the night unaided or whether it is due to a generalisation in the parents behaviour. Once parents have been taught to use behavioural treatment techniques and have understood the principle of reinforcement and how this can lead to a negative behaviour trap, they may then start to use these techniques to deal with other behaviour problems that their child may display. This may result in a decrease in the frequency of the behavioural problems reported to be associated with ISD following the successful education of parents rather than only due to the learnt ability of the child to self-soothe and sleep through the night unaided.

8. Implications for future use of bedtime-only interventions in treating ISD

8.1 Supervision of programme once implemented.

If future research shows that instructions given to parents can result in the generalisation of the infants behaviour following the bedtime-only intervention, then little supervision will be needed from health professionals once the parents have begun the programme. If, on the other hand, future research shows that it is most likely that the parent's behaviour will generalise, regardless of the instructions given to them, close supervision from health professionals will be necessary following the implementation of this type of programme. The reason for this is that it will be important to make sure that the parent's behaviour is generalising correctly and improving the infant's behaviour.

8.2 Cost effectiveness

Little time needs to be spent by the clinician or health professional helping the parents implement this type of programme as only one training session is necessary followed by some follow-up phone calls. This programme could make parents more receptive to the treatment of ISD offered to them by clinicians or health workers as it seems easier to implement and likely to be less stressful than the past intervention programmes used both at bedtime and throughout the night.

8.3 Parental compliance

Parents are also more likely to be compliant with this type of programme as they only need to implement it at bedtime. Implementing a programme at bedtime as well as at every waking may become stressful for parents as the night progresses and they become

fatigued. Also, because the parents are reinforced for their behaviours at bedtime these behaviours will generalise and be used to treat their infant's night wakings as well. This generalisation will occur because the parents have already experienced the rapid results of the programme when used at bedtime-only and have been reinforced for the behaviours used at bedtime. This could lead to a higher success rate in the treatment of infants with sleep problems and therefore less chance of the future development of other behavioural problems which have been found to be associated with sleep problems in infancy.

8.4 Limiting the amount of stimuli changed when the treatment begins.

The IGPI programme at bedtime-only was not effective in treating the sleep problems of two out of the five participants in this study. A suggested reason for this is that too many stimuli were being changed at once resulting in a strong resistance to treatment from the infant. In future implementations of this programme, health workers need to look closely at the cues associated with the infant's bedtime and decide whether it may be necessary to slowly change some of these cues before implementing the programme in order to avoid overwhelming the infant. This idea of not trying to remove too many stimuli at once when implementing a treatment programme is relevant to many other forms of treatment and not only limited to ISD.

9. Conclusion

In conclusion it can be seen that the successful treatment of ISD is possible by using behavioural management, specifically the IGPI programme, at bedtime-only. The PG and PGTA by the mothers allowed for the success of this ISD treatment programme. This

generalisation is suggested to have occured because of the rapid improvement in bedtime problems that parents noticed once they implement the programme. These improvements acted as a reinforcer for the new behaviours that the parents had learnt through implementing the programme at bedtime-only. This reinforcement lead the parents to start using these behaviours when managing their infant's night-time problems.

The findings of this study are of particular interest to ISD researchers because the possibility of behaviour generalisation following treatment has not been researched before. These findings will also be of interest to all health professions working in this area. This programme is likely to result in higher levels of adherence from the parents because they only need to implement the programme at one stage of the night, and therefore higher levels of successful treatment can be expected. Finally, these findings may also be of interest to society at large because a higher success rate in the treatment of ISD may result in a lower rate of the associated behavioural problems and therefore families and schools may have less behavioural problems to address.

The present study focused specifically on the success of using an IGPI programme at bedtime-only and therefore there are many avenues yet to be explored in relation to the success of using other sleep programmes at bedtime-only and the long term effects of ISD treatment at bedtime-only.

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FAX MESSAGE

TO: The Community Calander
ORGANIZATION: The Press

FAX NO: 3648288
FROM: Dr. France + Dione Matthesius.
DATE: 6 July 1999 TOTAL PAGES (including this header): 1

MESSAGE:

ATT: THE COMMUNITY CALANDER

To whom it may concern,

I am writing to you on behalf of The Canterbury Sleep Programme. In the past you have been so kind as to insert a notice concerning the acquisition of research participants, in the Community Calendar. We would be most grateful if you would be able to include it again. (A copy of the current notice is included below)

Thank you.
Kind Regards,

K. G. France ..... Dione Matthesius .....

Dr. Karyn France (Principal Investigator, Ph. 3642610)

Dione Matthesius

INFANT SLEEP PROBLEMS

The Canterbury Sleep Programme (CSP) at the University of Canterbury is offering help with implementing sleep programmes to parents of infants 6-24 months old. Parents will need to attend an interview, fill in data sheets, and carry out a sleep programme under the supervision of CSP staff. There is no charge. If you would like further information please telephone 3642209.

Department of Psychology
University of Canterbury

Child's name:_____ Week:_____

DAYTIME SLEEP

Date						
Time down and where						
Time awake						
Time down and where						
Time awake						
Time down and where						
Time awake						

NIGHTSLEEP

How did you get Baby ready for bed						
What time Baby first in cot						
Was Baby awake or asleep						
If awake did Baby call out or cry						
How long until settled						
What did you do during this time (see key)						
Present when baby fell asleep						
Hour and duration of awakening 1a.						
What did you do when baby awake (see key) b.						
2a.						
b.						
3a.						
b.						
4a.						
b.						
5a.						
b.						
6a.						
b.						
7a.						
b.						
Time awake in morning						

KEY (for example)
B/F=Breast or bottle feed
N/C=Nappy change
O/B=Our bed
=
=

DAYTIME SLEEP

Date		2·8·95
Time down and where		9·30
Time awake		10·30
Time down and where		12·00 car
Time awake		12·15
Time down and where		2·30
Time awake		3·30

NIGHTSLEEP

How did you get Baby ready for bed		dinner bath B/F, ROCK
What time Baby first in cot		7·30
Was Baby awake or asleep		AWAKE
If awake did Baby call out or cry		CRY
How long until settled		2 hours
What did you do during this time (see key)		B/F x 2 N/C, RC, O/B
Present when baby fell asleep		YES
Hour and duration of awakening	1a.	1-1·15
What did you do when baby awake (see key)	b.	B/F
	2a.	3·10-3·30
	b.	B/F N/C
	3a.	5·30-35
	b.	N
	4a.	
	b.	
	5a.	
	b.	
	6a.	
	b.	
	7a.	
	b.	
Time awake in morning		

KEY (for example)

B/F=Breast or bottle feed

N/C=Nappy change

O/B=Our bed

N = nothing

R = Rock

C = Cuddle

INSTRUCTIONS FOR DAY-TIME

Time down and where: What time he/she went to sleep and where he/she went to sleep, this includes sleeps in the car, on peoples' laps etc.,

Time Awake: What time he/she awoke

NIGHT-TIME SLEEP

How did you get baby ready for bed?: What you did or the routine you engaged in before putting him or her down for the night.

What time baby first in cot?: What time did you put him or her in the bed/cot for the night-time sleep.

Was the baby awake or asleep?: W he or she awake or asleep when placed in the bed/cot.

If awake did he/she call out/cry? Fill in type of sound.

For how long?: How long did she or h continue to call out or cry after being placed in the bed or cot.

What did you do?: Add to the Key by making up your own abbreviations for what you did to help settle your baby sleep.

Present when baby fell asleep?: a parent with the baby when he or she fell to sleep? For example, if he/she asleep while being fed, in someone's arms, or on a sofa/mat etc., and wen bed asleep, or if someone sat or lay beside the cot until the baby fell asl answer yes.

Hour and duration of awakening: Write beside a. the hour when he or s was awake, and how long he or she awake for.

What did you do?: Beside b. see number 6 above.

THANKYOU VERY MUCH FOR HELPING US LEARN MORE ABOUT BABIES SLE

APPENDIX 3

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CANTERBURY SLEEP PROGRAMME: EVALUATION QUESTIONNAIRE

- *PLEASE CIRCLE YOUR ANSWER*

1. How would you rate the quality of help you received?

1	2	3	4
Poor	Fair	Good	Excellent

2. Did you get the kind of help (or service) you wanted?

1	2	3	4
No, definitely not	No, not really	Yes, generally	Yes, definitely

3. To what extent has the sleep programme met your needs?

1	2	3	4
None of my needs have been met	Only a few of my needs have been met	Most of my needs have been met	Almost all of my needs have been met

4. If a friend were in need of similar help, would you recommend the programme to him/her?

1	2	3	4
No, definitely not	No, I don't think so	Yes, I think so	Yes, definitely

5. How satisfied are you with the amount of help you have received?

1	2	3	4
Quite dissatisfied	Indifferent, or mildly dissatisfied	Mostly satisfied	Very satisfied

6. Have the services you received helped you to deal more effectively with other difficult child behaviour?

1	2	3	4
No, they seemed to make things worse	No, they really didn't help	Yes, they helped somewhat	Yes, they helped me a great deal

7. In an overall, general sense – how satisfied are you with the service you received?

1	2	3	4
Quite satisfied	Indifferent, or mildly satisfied	Mostly satisfied	Very satisfied

8. **If your child had sleeping difficulties again, would you come back to the Canterbury Sleep Programme?**

1	2	3	4
No. definitely not	No. I don't think so	Yes. I think so	Yes. definitely

9. **How stressful did you find the sleep programme?**

1	2	3	4
Very stressful	Moderately stressful	Somewhat stressful	Non-stressful

- *COULD YOU PLEASE COMMENT ON THE FOLLOWING ASPECTS*

1. The instructions explaining the programme procedure. (E.g. were they logical, ambiguous, hard or easy to follow, confusing etc.....)

2. The method of teaching your child to sleep alone. (E.g. was it too slow, too difficult to follow, seemed rational etc.....)

3. The telephone support given by the therapist. (E.g. was it too frequent, not often enough, helpful or not, etc.....)

4. Keeping daily records of the sleep pattern of your child. (E.g. was it too tedious, useful, etc.....)

5. Any other criticisms or comments

SLEEP PROGRAMME
STRUCTURED INTERVIEW FORMAT

Family Surname: Date of Initial Interview:
Address: Phone Number:

Referral: Family Doctor consulted: Yes/No

Household Composition

Adults: Names: Age: Race: Occupation

Children:

Significant others - re child minding

Child having Sleep problem D.O.B.

Actual Bedtime: Ideal Bedtime:
Actual Settling time: Ideal Settling time:
Down Awake/Asleep:
Actual Getting up time: Ideal Getting up time:
Diary Completed:
Number of Days:

Average night wakings over whole of sleep time:

Daytime sleep? Yes/No Actual times _____

Describe Nature of Sleeping Problem

Sleep History:
Birth -3 months:

3 months - 6 Months

6 months - 12 Months

Age at onset Continuous/intermittent

Clear Preciptating Event Yes/No
Describe

Describe Child's development so far:

Pregnancy

Birth

Feeding

Activity

Crying

Medical History

Birth Order 1, 2, 3, or subsequent
Sleeps Alone? Not alone
Describe

Family Life Events over Child's Life

Other problems Child: present/absent

Family: present/absent

Describe

What is done to handle the child's problem?

What has been done in the past? (i.e other programmes)

Is medication used now Yes/No

Describe

Has medication been used in the past Yes/No
Describe

Suggested Programme:

Rationale:

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CANTERBURY SLEEP PROGRAMME.

Parent's Information Sheet.

Thank-you for agreeing to take part in the Canterbury Sleep Programme. This research programme was begun in 1981 and has completed several studies into the development and management of infant sleep. The information generated is used to inform parents about infant sleep, as well as to inform their advisors such as Doctors, Plunket Nurses and Psychologists.

The part of the Canterbury Sleep Programme that you are joining offers a well-established, supervised programme to parents of infants (6-24 months of age) who have sleep problems. The research aims are to measure the change in your infant's night wakings due to intervention at bed-time only. We are interested, particularly, in how many night wakings occur, and in the amount of time your infant cries during the programme. In order to evaluate this, you will be asked to fill in daily sleep diaries throughout the programme. In addition, we will bring an infra-red time-lapse video recorder to your home, 3 times through out the programme, in order to monitor this. The video recording technology is well established. Our low illumination, time-lapse video equipment is used to get a direct measure of your infant's sleep. It uses an invisible light source in order for filming to be unobtrusive. The camera will be mounted beside your child's cot. This allows us to film your child throughout the night without disturbing him/her. The time-lapse allows us to fit two nights of recording onto one tape.

We are also interested in parents' opinions about, and reactions to the programme and the CSP staff. We will therefore ask you to fill in some questionnaires about the programme, our service and your reactions over time.

Your part in the research will be as follows:

1]. Once we have your name and have given you an interview time, we will assess the type of sleep problem your child has and ask some questions in order to rule out any developmental and medical problems. We will check that you want to do the programme and that you understand the project, and ask you to sign a consent form.

2]. We will explain and ensure that you understand the programme. The programme has been established and written up in the literature and has been effective in diminishing sleep problems. The programme has been tailored in order to decrease both parent and infant distress.

3]. We will negotiate a time for some video equipment to be brought round to your home and set up in the room in which your child is sleeping.

4]. Your part in the research will be to fill in some record sheets about your infant's sleep pattern, fill in a questionnaire, carry out the programme as well as you can. When video equipment is brought to your home we will need you to turn the equipment on just before your child goes to bed abd off when they get up in the morning, and to contact us if you have any problems.

5]. You will be asked to record your infant's sleep before and during the programme and then for a week, 3months after the programme has been completed.

The contact persons for the programme are:

Dione Matthesius **Bus:** 3642987 ext. 7887 or 021 2151310

A.H: 3439823

Dr. Karyn France **Bus:** 3642610

A.H: 3432935

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CANTERBURY SLEEP PROGRAMME

Consent Form

1]. I/we have read and understood the description of the research programme above.

2]. I/we agree to record our infant's sleep pattern, to fill out some questionnaires, to carry out t programme, and to contact CSP staff if there are any problems.

3]. I/we understand that all information collected will be confidential to the Canterbury Sleep Programme. I/we consent to publication of the results of the programme with the understand that data will be reported anonymously, and that the videos will be used for no purpose other data analysis without my/our written permission.

4]. I/we agree to turn the video equipment on/off as instructed, and to notify a Canterbury Sl Programme contact person should the equipment develop any problems. I/we understand tha video equipment is not our responsibility.

5]. I/we understand that we are free to withdraw our child, and any information we may have provided, from the programme at any point without prejudice.

Signed:

---------- (parent) ---------- (parent)

---------- (CSP staff)

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YOUR PROGRAMME

- At bedtime (_____) carry out a regular bedtime routine. This routine is to be exactly the same every night throughout the programme.

- The routine will be as follows:

_____

_____

_____

_____

_____

- If any signaling occurs once you have put _____ to bed you will be waiting longer and longer periods of time before attending to her. When you do attend to _____, your interactions should be brief and as minimal as possible (i.e. a pat on the head or tucking in).

- The programme will proceed as follows:

  DAY 1 & 2 : Once you have completed the bedtime routine, leave the room. If any signaling occurs, wait 5 minutes before attending to _____. Leave the room after 30sec., and wait another 5 minutes before attending to _____. Leave the room after 30 sec. Now wait 10 minutes before attending to _____. Leave the room after 30sec. From now on wait 15 mins before attending to _____. Only ever attend to _____ for a maximum of 30 sec.

  DAY 3, 4 & 5 : Once you have completed the bedtime routine, leave the room. If any signaling occurs, wait 10 minutes before attending to _____. Leave the room after 30 sec. From now on wait 15 minutes before attending to _____. Only ever attend to _____ for a maximum of 30 sec.

  DAY 6 ONWARDS : Once you have completed the bedtime routine, leave the room. If any signaling occurs, always wait 15 minutes before before attending to _____. Only ever attend to _____ for a maximum of 30 sec.

- If any night wakings occur, treat them the same as you did before the beginning of the programme.

- Treat any signaling before _____ as a night waking and any after that as get up time for the morning.

APPENDIX 8

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CANTERBURY SLEEP PROGRAMME.

MAINTENANCE PROGRAME

Now that you are happy with _____sleep pattern and feel that the programme has been successful, you are ready to move onto the maintenance programme.

During this stage of the programme you will:

- Check on _____ every time _____ cries when awakening during the night.
- This checking should be brief and should involve as little interaction with _____ as possible.
- The sole purpose of you checking _____ is to establish whether _____ is ill or very upset due to something like a nightmare.
- If you feel that there is a clear reason for the crying, then attend to _____ in order to ensure _____ safety and well being, and then return _____ to_____ bed and leave the room.
- If you do not feel there is a clear reason for _____ crying, then leave the room as quickly as possible and ignore any further crying during that awakening.
- If you find that the night wakings increase, particularly after an illness or change in routine, a few nights return to the programme may be necessary.

Please remember to call the Canterbury Sleep Programme staff at any time should you have any questions about the programme.

APPENDIX 9

Time placed in the cot at the beginning of the night	Time taken to fall asleep at the beginning of the night	Parental interaction/ behaviour recorded correctly	Time and duration of night wakings correct	Parental interaction/ behaviour recorded correctly

APPENDIX 10

ANOVAS RUN FOR COMPARISON PURPOSES

To further analyse the data, one-way, repeated measure analyses of variance (ANOVA) were used. These were done in two different ways. First, the significance of the mean differences in the frequency of night wakings, between the three phases (i.e., baseline, intervention, and follow-up) were tested for all seven participants. Second, the significance of the mean differences in ISOD, NSOD were calculated within the intervention phase only. These were only calculated for Participants 1-5 as too many interventions were used with Toby and David. Only the intervention phase was used in these calculations as most of the infants were put to bed asleep and breastfed back to sleep after night wakings, during the baseline phase. This resulted in an increase in settling time from baseline to intervention. Any statistical analyses across the three phas would give results that were not representative of the treatment effects as a whole.

The results of the first ANOVA comparing the average number of wakes for all participants, across the three phases, showed a significant result, $F(2,10) = 18.794$, $p<0.001$. A planned comparison was done between the number of wakes at baseline anc intervention, which showed a significant difference, $p=0.032$. This shows that the numb of wakes decreased as a result of the intervention. No planned comparisons were done

with the follow-up data as two of the infants were sick during this phase, and there was also no data for one of the infants.

The results of the second ANOVA showed that there was a significant difference in the ISODs of Participants 1-5, across the intervention phase, $F(2,8) = 12.041$, $p<0.05$. A planned comparison was done on this data and the linear contrast was not significant, $p=0.08$.

The third ANOVA also showed a significant difference in the NSODs of Participants 1-5 across the intervention phase, $F(2,8) = 9.850$, $p<0.01$. A planned comparison showed a significant linear contrast between this data, $p=0.026$.

RAW DATA

Participant 1 (Craig)

phase	wakes	onset-time	night-time	total
baseline1	5	45	50	95
2	4	75	40	115
3	6	60	55	115
4	4	20	45	65
5	4	60	40	100
6	6	30	34	64
7	4	25	40	65
intervention	1	100	30	130
2	4	15	135	150
3	0	70	0	70
4	0	30	0	30
5	3	30	30	60
6	3	50	30	80
7	2	60	25	85
8	1	40	105	145
9	0	30	0	30
10	1	15	120	135
11	1	25	5	30
12	1	20	10	30
13	0	15	0	15
14	0	10	0	10
15	1	10	10	20
16	1	15	35	50
17	0	10	0	10
18	1	10	15	25
19	2	30	20	50
20	1	5	5	10
21	1	5	0	5
22	0	15	0	15
23	1	10	10	20
24	0	0	0	0
25	0	10	0	10
26	0	0	0	0
27	0	10	0	10
28	0	10	0	10
29	3	4	115	119
30	0	15	0	15
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				

44				
45				
46				
47				
48				
Follow-up	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	2	15	15	30
5	0	5	0	0
6	0	0	0	0

Participant 2 (Carl)

phase	**wakes**	**onset-time**	**night-time**	**total**
baseline 1	5	0	124	124
2	3	0	44	44
3	2	0	19	19
4	2	0	32	32
5	3	0	28	28
6	3	0	24	24
7	3	0	31	31
8	5	0	72	72
Intervention	4	40	149	189
2	4	20	110	130
3	5	60	96	156
4	3	115	46	161
5	5	25	72	97
6	4	15	50	65
7	5	25	63	88
8	4	95	55	150
9	4	50	72	122
10	4	20	74	94
11	4	23	105	128
12	4	45	138	183
13	4	50	106	156
14	3	5	45	50
15	4	45	46	91
16	4	30	43	73
17	4	30	68	98
18	3	5	28	33
19	3	14	61	75
20	2	10	114	124
21	2	25	125	150
22	2	20	80	100
23	0	14	0	14
24	2	10	74	84
25	2	50	78	128
26	0	7	0	7
27	1	5	155	160
28	0	2	0	2
29	0	17	0	17
30	1	10	45	55
31	0	20	0	20

32	0	35	0	35
33	1	2	8	10
34	0	10	0	10
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				
46				
47				
Follow-up	2	10	10	20
2	1	25	10	35
3	1	10	45	55
4	1	120	10	130
5	1	40	7	47
6	0	0	0	0

Participant 3 (Trent)

phase	**wakes**	**onset-time**	**night-time**	**total**
baseline 1	1	15	5	20
2	0	10	0	10
3	2	15	25	40
4	2	20	35	55
5	2	10	65	75
6	1	15	25	40
7	2	20	45	65
8	2	15	40	55
9	3	15	65	80
interventior	1	0	30	30
2	0	35	0	35
3	1	9	20	29
4	3	1	31	32
5	1	1	40	41
6	1	7	15	22
7	3	16	65	81
8	2	0	45	45
9	1	18	15	33
10	2	0	39	39
11	1	15	75	90
12	2	0	60	60
13	1	0	75	75
14	1	5	15	20
15	1	0	20	20
16	1	15	25	40
17	3	0	85	85
18	2	0	105	105
19	1	0	15	15

20	3	0	50	50
21	2	5	35	40
22	2	2	10	12
23	1	1	15	16
24	1	0	60	60
25	1	2	60	62
26	1	5	10	15
27	2	1	40	41
28	3	1	30	31
29	1	0	5	5
30	2	3	30	33
31	2	0	25	25
32	2	1	15	16
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				
46				
Follow-up	0	0	0	0
2	1	10	35	45
3	1	0	10	10
4	1	10	15	25
5	1	0	45	45
6	1	11	20	31

Participant 4 (Claire)

phase	**wakes**	**onset-time**	**night-time**	**total**
baseline 1	3	30	75	105
2	4	0	115	115
3	5	0	75	75
4	3	0	45	45
5	5	0	65	65
6	4	0	70	70
7	4	0	30	30
8	4	0	70	70
9	4	0	55	55
10	5	5	75	80
11	4	0	40	40
intervention	3	40	30	70
2	3	15	35	50
3	4	2	35	37
4	5	2	50	52
5	3	1	30	31
6	3	25	50	75

7	3	15	70	85
8	6	0	155	155
9	3	4	60	64
10	4	0.5	55	55.5
11	4	0	45	45
12	3	0	58	58
13	2	0	14	14
14	2	0	4	4
15	0	0	0	0
16	1	0	5	5
17	1	6	5	11
18	1	0	2	2
19	3	0	120	120
20	4	0.9	60	60.9
21	2	0	14	14
22	4	0	75	75
23				
24				
25				
26				
27	2	0	28	28
28	2	0	40	40
29	2	1	29	30
30	1	0	5	5
31	1	0	5	5
32	1	0	5	5
33				
34				
35				
36				
37				
38	3	0	33	33
39	1	10	20	30
40	2	0	30	30
41	1	0	30	30
42	3	0	15	15
43	1	20	15	35
Follow-up	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	2	0	2
5	0	0	0	0
6	0	0	0	0

Participant 5 (Ingrid)

phase	**wakes**	**onset-time**	**night-time**	
baseline 1	4	60	105	165
2	1	60	30	90
3	1	60	150	210
4	1	60	15	75
5	3	50	60	110
6	6	60	180	240
7	7	30	180	210
8	6	30	190	220

9	7	60	150	210
10	8	90	105	195
11	6	30	120	150
12	7	30	108	138
Programme	1	30	10	40
2	1	50	25	75
3	1	40	15	55
4	0	20	0	20
5	0	20	0	20
6	1	15	60	75
7				
8				
9				
10	3	20	30	50
11	3	20	35	55
12	4	15	50	65
13	2	10	25	35
14	2	10	30	40
15	1	10	10	20
16	1	10	10	20
17	2	10.2	15	25.2
18	2	5	25	30
19	1	5	10	15
20	1	10	15	25
21	2	15	45	60
22	0	10	0	10
23	1	2	10	12
24	1	5	10	15
25	1	2	15	17
26	1	5	10	15
27	1	7	10	17
28	1	10	10	20
29	1	10	8	18
30	1	10	10	20
31	1	10	5	15
32	1	5	7	12
33	1	5	5	10
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
Follow-up	1	5	15	20
2	0	15	11	26
3	0	60	10	70
4	1	5	5	10
5	1	5	5	10
6	1	5	8	13

Participant 6 (Toby)

phase	wakes	onset-time	night-time	total
baseline 1	2	60	340	400
2	1	0	30	30
3	3	0	150	150
4	1	90	120	210
5	3	0	240	240
6	10	60	110	170
7	4	30	70	100
8	2.97	0	60	60
9	4	0	125	125
10	4	2	106	108
programme	4	150	209	359
2	1	220	70	290
3	4	190	35	225
4	4	0	276	276
programme	1	60	10	70
6	4	57	338	395
7				
8	1	195	20	215
9	4	70	77	147
10	3	90	70	160
11	2	5	63	68
12	4	5	54	59
13	4	0	125	125
programme	3	90	102	192
15	2	50	159	209
16	1	0	15	15
17				
18				
19	2	40	251	291
20	1	35	85	120
21	2	5	27	32
22	2	50	344	394
programme	1	55	45	100
24	1	0	300	300
25	3	0	49	49
26	2	0	270	270
27	3	0	32	32
28	2.07	0	95	95
29	2	0	20	20
30	3	10	103	113
31	3	0	16	16
32				
33	1	0	75	75
34	2	0	80	80
35	3	0	98	98
36	1	0	15	15
37	4	5	159	164
38	1	20	78	98

programme	2	5	40	45
40	1	20	121	141
41	1	60	15	75
42	0	60	0	60
43	1	15	12	27
44	0	55	0	55
45	2	5	21	26
46	0	20	0	20
47	1	1	150	151
48	1	5	130	135
49	2	5	54	59
50	1	5	35	40
51	1	5	12	17
52	1	5	10	15
53	2	20	38	58
54	1	5	15	20
55	1	10	7	17
56	1	10	5	15
57	1	2	9	11
58	1	2	5	7
59	1	2	5	7
60	3	5	9	14
61	1	0	28	28
62	0	2	0	2
63	0	2	0	2
64	0	2	0	2
65	1	2	5	7
66	0	15	0	15
67	1	2	4	6
68				
follow-up 1	1	15	55	70
2	1	0	79	79
3	1	0	40	40
4	0	0	0	0
5	1.03	60	60	120
6	0	10	0	10

Participant 7 (David)

phase	**wakes**	**onset-time**	**night-time**	**total**
baseline 1	8	0	120	120
2	5	0	58	58
3	6	0	62	62
4	7	0	93	93
5	5	0	63	63
6	4	0	71	71
7	6	0	82	82
8	7	0	63	63
9	5	0	48	48
10	6	0	75	75
Programme	5	180	50	230
2	6	300	40	340
3	7	115	101	216
4	5	110	137	247
5	4	135	54	189

6	4	185	94	279
7	4	160	85	245
Baseline 2	4	0	45	45
9	4	0	104	104
10	5	0	42	42
11	5	0	55	55
12	4	0	78	78
13	4	0	93	93
14	4	0	38	38
15	5	0	87	87
16	5	0	98	98
17	3	0	53	53
18	5	0	98	98
19	3	0	53	53
20	4	0	109	109
21	4	0	59	59
P.P. and h	2	30	86	116
23	2	20	145	165
24	1	8	30	38
25	4	10	163	173
26	1	10	18	28
27	3	5	29	34
28	2	15	87	102
29	1	4	41	45
30	1	9	5	14
31	3	10	52	62
32	3	5	211	216
P.P and ho	3	7	80	87
34	6	5	113	118
35	2	2	87	89
36	4	4	30	34
37	4	10	58	68
38	2	10	36	46
39	5	5	50	55
40	6	4	39	43
41	5	10	30	40
42	5	5	31	36
43	3	3	67	70
47	4	25	22	47
48	3	2	7	9

49	5	5	22	27
50	5	15	25	40
51	1	4	5	9
52				
53				
54				
55				
56				
57				
58				
59	7	2	32	34
60	6	5	47	52
61				
62				
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73				
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91				
92				
93				
94				
95				
96				
97				
98				
99				
100	5	15	21	36
101	6	10	21	31
102	5	10	7	17
103	5	0	39	38